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The Genus *Clastoptera* in America North of Mexico.

KATHLEEN C. DOERING, Department of Entomology.

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C.festacea ♀
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30.
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C.newporta
C.texana
C.siskiyou
C.ovata
C.pallidocephala
C.elongata
C.tricincta

INTRODUCTION.

HISTORICAL REVIEW.

THE genus *Clastoptera* was described by Germar in his *Zeitschrift für Entomologie* in 1838, in which he describes *Clastoptera xanthocephala* and *C. achatina*. However, Say described *Cercopis obtusa* in 1825, which later was placed in the genus *Clastoptera*. Fitch in 1851 described three species, *pini, testacea* and *proteus*. Of the latter he made numerous subspecies and varieties, based on slight color variations which are untenable. For this reason, and also because of his system of using Roman numerals and names to designate the subspecies, with the varieties under them designated by letter but without names, subsequent writers were greatly confused. This in part explains the many mistakes which have been made in the literature since that time. In 1854 Stål described *Clastoptera lineatocollis,* which, because of the vagueness of his description, in its turn has caused considerable confusion. In 1872 Provancher added his share to the general mix-up by writing a description of a so-called new species, which he called *Clastoptera saint-cyri.* Then in 1885 he changed this to a variety under the species *Clastoptera proteus* Fitch.

Certain workers have failed to notice this change and have attempted to synonymize certain species with *saint-cyri,* which later have proved to be varieties of *proteus* and not *saint-cyri* at all. Uhler in 1875 described *Clastoptera delicata,* which in the literature has been synonymized in various ways with other forms by all subsequent writers. In many cases it has been used interchangeably with *lineatocollis,* so that it is very difficult in many treatises to know which form the writer in question had in mind. In 1895 Gillette and Baker described another species, *Clastoptera osborni,* which brings us up to Doctor Ball's paper, published in 1895. To date this was by far the most complete paper on the genus *Clastoptera.* It was valuable at this time in that it served as a summary of the recognized species and varieties. However, as Doctor Ball (1927) himself states, "many mistakes in nomenclature and the interpretation of previous descriptions" were made in this paper, due for the most part to the "adoption of Fitch's method of presentation involving named subspecies and lettered varieties." But the writer is of the opinion that part of the confusion at that time, as well as at the

present time, is due to Doctor Ball's belief that there are only four distinct species existing in the United States. The four species which he retained in 1895 were *Clastoptera proteus, Clastoptera delicata, Clastoptera obtusa,* and *Clastoptera xanthocephala.* In 1900 Baker published some critical notes on the genus, in which he attempted to straighten out the nomenclature. In general his changes were correct, especially in regard to making *binotata* and *osborni* distinct species instead of varieties. Van Duzee in 1912 described the variety *tristis,* which is still good, and the variety *glauca,* which, however, as Ball pointed out, is synonymous with Fowler's *Clastoptera unicolor.* He likewise made certain helpful criticisms and pointed out certain errors in nomenclature made by Doctor Ball, but incorrectly synonymizes *Clastoptera pini* with *proteus.* Doctor Ball in 1919 published a second paper on Cercopidæ in which he describes five additional varieties. Then in 1920 McAtee published a summary of the Cercopidæ taken around Washington, D. C., and the specimens contained in the National Museum collection. In this paper three new varieties are described, two by McAtee and one by Gibson. Another large systematic paper on the Cercopidæ was published by Stearns in 1923 in the Hemiptera of Connecticut. Finally in 1927 Doctor Ball published a revision of the genus north of Mexico, in which he still retains his four species and about twenty-five varieties.

PURPOSE OF PAPER.

From the historical account just given it is evident that the genus *Clastoptera* is in a state of much confusion. There is scarcely a species or variety in the entire group but what has been confused at some time or another with some other form. Moreover, no two writers have ever agreed about the various species and varieties. For this reason it has been apparent to many workers that a detailed revision of the genus was necessary. McAtee (1920) states:

> "The classification and nomenclature of this genus is much in need of revision. The principal basis for the existing conception of the group is Doctor Ball's 1895 paper. This essay was prepared at a time when the proper differentiation of subspecies and varieties of nomenclature, also, were little observed. No one is more aware of its faults than its author, and it is to be hoped Doctor Ball can find time to give us a revised classification not only of this genus but of the whole family."

Accordingly in 1927 Doctor Ball published a revision of the genus in which he listed all the forms known to him, and added several new varieties. However, the writer felt, since Doctor Ball

did not go into the structural details at all except to make a key to his four species and gave only brief color descriptions of the various forms, that a more detailed treatise based on structural studies and drawings of the genus would be useful. Doctor Ball's notes on distribution and food plants are very valuable in supplementing any work based on structural characteristics, but without the latter they are inadequate.

Therefore in this paper the writer has attempted to employ any and all structural characters that might possibly be of use in classification. Anyone who has worked with this genus will agree that it is a very difficult group to classify. Fowler (Biologia Centrali Americana) states that the members of this genus are "very variable in coloration, and it is almost impossible to distinguish them by descriptions." To substantiate his claim he gives the following quotation from Stål, in the Bidrag till Rio Janeiro, Trakten's Hemiptera Fauna, II, p. 16: "Species hujus generis non nisi coloribus inter se differunt, plurinæ difficillime distinguunter et discribuntur; aliæ igitur certe aliarum tantum varietates." To this quotation he adds the following statement: "The punctuation and general size and shape, however, afford fair characters in some cases."

Doctor Ball (1927) makes the following statements:

"The members of this genus are all small and globose and are easily separated from other Cercopidæ, but here the easy part abruptly ends. . . . Under the circumstances it is manifestly impossible to determine the number of species involved or to work out a stable nomenclature until extended collecting and careful life history has been done in the areas involved. . . . Some of these units may possibly be further divisible; if so, these divisions should also present good structural characters or certain definite and unchanging color characteristics, or both. Two or three times, during the course of the years, the writer has become convinced that some one form or other was distinct, only to find later that additional material from some other locality or season so thoroughly intergraded as to make it exceedingly doubtful. In general, the fewer the specimens the easier it is to believe that a distinct species exists."

Therefore, because of the difficulty in separating these forms, the writer considered it essential to make a study of the following characteristics: The inflation of the face; the extension of the front (tylus) beyond vertex; the width of the eyes as compared to the width of the head; the distance between the ocelli as compared to the distance between each ocellus and eye; the number and depth of the wrinkles on the pronotum; the length and general shape of the body, including the inflation of elytra; the margins of the elytra and the length of the elytron beyond the scutellum; wing venation,

including size and shape of the apical callous (bulla); the number and length of the hairs on the wings; the external genitalia of both sexes, and the internal genitalia of both sexes where this was possible. In addition to these structural differences, certain color characters were used, namely, the color of the face and the general color pattern of the elytra and pronotum.

Not all of these characteristics were of equal importance in classification of this group. The most commonly used characters were the inflation of the face, the extension of the front, the wrinkles on the pronotum, the length of the body, size of the apical callous, the structure of the inner valve of the ovipositor, the color of the face, and, of course, the general color pattern. Of these, probably the two most valuable ones were the color of the face and the inner valve of the ovipositor. All of the other characters were used at various times to distinguish a few species from each other, but none of them, except the last two mentioned above and the color pattern, were used constantly to separate each species from every other species.

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DISTRIBUTION.

The genus *Clastoptera* is well distributed over the United States, specimens having been taken from practically all parts. They have also been taken extensively in Canada and Mexico. In fact Fowler stated that they were fairly common throughout North, Central and South America. Although Doctor Ball (1927) retained only four distinct species with twenty-five varieties, the writer cannot follow him in this respect. Instead, the writer maintains that there are thirty distinct species, with only six varieties. Of these species the ones which have the greatest range of distribution in the United States are *Clastoptera obtusa, C. xanthocephala,* and *C. proteus* var. *nigricollis.* Wherever these are taken they are usually collected in fairly large numbers, too. Other species which have been taken in large series are *C. osborni, C. delicata, C. lineatocollis, C. arborina, C. canyonensia, C. elongata* and *C. pallidocephala.* These, however, are apparently considerably limited in range.

MORPHOLOGY AND TECHNIQUE.

In order to make the discussion of the genus more complete and clear, it might be well to call attention to a few morphological facts which have not been mentioned in the following descriptions, and to explain the technique used in obtaining certain data and making certain drawings.

In the first place, all descriptions refer to female specimens. The males in the majority of cases differ from the females in several ways. They are always smaller, although this variation in size differs in the different species, some being only slightly smaller than the females, as in *xanthocephala,* while others are considerably smaller, as in *delicata.* Also, in the majority of species the males are much darker than the females, and often the front protrudes cephalad less than in the females. Secondly, in studying the wing venation it was apparent that there is no variation in the venation of the hind wing. Therefore this wing was not figured.

In order to study the wing venation of the elytra they were mounted on microscope slides in gum arabic. The drawings were made from these slides and therefore might not possibly always check exactly with the wings as they appear on the body, since the latter have not been flattened out as they have on the slides. In studying the hairs of the elytra the slides were again used and a

drawing of the third anal cell was made, showing the distribution of the hairs on that region. By using an eyepiece scale marked off into squares, the distribution of the hairs in the various species can easily be compared by counting the number found in one square on a given part of the elytron. The Comstock-Needham system of nomenclature for the veins of the wings was used, based upon Metcalf's (1917) work on the tracheation of the nymphal wing pads.

The writer found that the external genitalia of both sexes cannot usually be used as a superficial characteristic in classification. This is due to the position in which they are held on the body. Normally they are bent dorsad at more or less of an angle to the body and thus are usually too much hidden by the elytra to be seen plainly. Therefore, in making the examinations and drawings of the genitalia the specimens were first relaxed and the pygofer dissected from the body. From an examination of plates it can easily be seen that the external male genitalia, except for distinguishing the larger groups, are of little value. The chief value of the external female genitalia lies in the proportional length of the ovipositor and the pygofer.

The internal genitalia, likewise, proved to be of little value in classification of the males, except to divide the species into four larger groups, namely *proteus, obtusa, arborina,* and *osborni* groups. If certain closely related species are studied side by side in a relative way it is usually possible to pick out minor differences, but these are difficult to point out and describe. Then, too, mere difference in size was occasionally useful.

The inner valves of the ovipositor fortunately are of great assistance in determining the species. The variations are not always outstanding, but no matter how slight they are they always appear to be constant for the species. To prove this, where the material was abundant, the writer made from four to six slides of the same species from as many localities as possible, and in every case where it was at all possible she made at least two slides. For this reason she is reasonably certain that the differences in the valves are constant. The outer valve was used in some cases, since it varies with regard to its general shape, the size of the membrane and in its relative length when compared with the ninth sternite. At first the writer thought there might be some variation in the number of hairs on this valve which would be a useful taxonomic character, but the differences proved to be negligible. The middle valve of the ovi-

positor in this genus is also of little systematic importance. At first glance it seemed that there were differences in these valves, but later investigation did not bear this out, except in a few cases where the base was greatly expanded. Perhaps more careful technique and study of these valves might reveal other differences.

DESCRIPTION OF GENUS AND KEY TO SPECIES.

ORIGINAL DESCRIPTION OF GENUS.

Kopf gross, stumpg dreieckig, so breit wie der Vorderrucken, Stirn gewolbt, queerstreifig, Scheitel breit viereckig, vorn und hinten scharf gerandet, die Nebenaugen auf der mitte des Scheitels genahert. Schnabel bis an die Hinterbrust reichend, Fuhler in einer Grube und der Wurzel der Wangen, sehr kurz, mit langer feiner Endborste. Vorderrucken breit am Scheitel vorgezogen and gerundet, bei den Augen gebuchtet, von den aber tief ausgerandet. Schildchen ein langgezogenes spitzwinkeliges dreick bildend. Deckschilde lederartig, an der Spitze gewolbt, uber einander klapfend, die hintere Randader weit von dem Hinterrande entfernt. Flugel hautig, unter den Deckschilden verborgen.

WRITER'S DESCRIPTION OF GENUS.

Form, small, globose, although extremely variable in size and color markings; head considerably wider than long, with the head and anterior part of pronotum at an angle with rest of body; vertex extremely narrow, slightly depressed transversely, anterior margin usually slightly carinated; ocelli placed midway between anterior and posterior margins of vertex, or nearer anterior margin than pronotum; eyes broad, on same plane with vertex; front extending cephalad beyond vertex in varying degrees, sometimes scarcely visible from above, in some forms equal to length of vertex; postclypeus not longitudinally carinated, inflated in varying degrees according to species; antennæ inserted in deep cavities between eyes and postclypeus; pronotum convex, broader than long, transversely wrinkled, anterior margin broadly rounded, lateral margins divergent, posterior margin deeply emarginate; scutellum triangular, much longer than wide; hemelytra pubescent, convex, deflected posteriorly, clavus with apex broadly rounded, corium terminating in a hyaline membrane, sometimes apical portion of corium also more or less hyaline with a conspicuous, usually protruding, callous

spot near apex. Posterior tibia with a single terminal row of spines; ovipositor and male genital plates usually bent dorsad at an angle to rest of body.

KEY TO SPECIES.

PAGE

1. Few deep pronotal wrinkles or distinct bands, numbering twelve or less on median line; postclypeus generally greatly inflated 2
   Pronotal wrinkles many, usually numbering sixteen to twenty-five along median line, indistinct in *proteus* group, distinct in others; postclypeus generally moderately or slightly inflated, *saint-cyri* excepted 11
2. Elytra fuscous-brown with a distinct, broad, white band across clavus; wrinkles numbering eleven or twelve along median line 3
   Elytra without white band; wrinkles or bands less than ten on median line 4
3. Front longer than vertex; size smaller, between 3.5 mm. and 3.7 mm. *C. arizonana* n. sp., 73
   Front not more than two-thirds length of vertex; size larger, between 4 mm. and 4.5 mm. ..... *C. lawsoni* n. sp., 71
4. Mostly black in color 5
   Fuscous and brown, striped and banded in yellow 8
5. Black with white spot midway on costal margin; other hyaline or light markings on elytra and face 6
   All black above and below; front as long as or longer than vertex; length 4.6 mm. to 4.8 mm. ..... *C. sierra* n. sp., 33
6. Postclypeus black with five or six pairs of light arcs anteriorly; elytra with apex brownish-hyaline and without clear hyaline areas around apical callous; length 3.75 mm. to 4 mm. ..... *C. binotata* n. sp., 30
   Postclypeus without light arcs; smaller, elytra with more or less clear hyaline areas around apical callous 7
7. Postclypeus black except for occasionally faint indications on lateral margins. *C. brunnea* Ball (black male), 26
   Postclypeus with a light band across posterior margin. *C. lineatocollis* Stal (black male), 20
8. Larger, elongate, measuring 4.5 mm. to 4.9 mm. in length; front usually longer than vertex 9
   Smaller, measuring between 3.4 mm. and 4.3 mm.; front usually not over two-thirds length of vertex 10
9. Greenish-yellow or sometimes washed in fuscous with white veins in sharp contrast, *C. delicata* Uhler, 24
   Bronze, or brownish with markings more or less obscure on elytra; arcs and spot on postclypeus more prominent ..... *C. lugubris* Ball, 28
10. Yellow and light fuscous with prominent yellow veins; postclypeus yellow with light spot or band, preceded by five or six pairs of arcs ..... *C. lineatocollis* Stal, 20
    Darker, with markings less prominent; face mostly all black ..... *C. brunnea* Ball, 26
11. Face with anterior portion shining black, rest bright yellow; wrinkles shallow or sometimes scarcely discernible 12
    Face uniformly yellow or brown, or anterior portion at least chiefly yellow; wrinkles deep and usually fine 18
12. Body elongate, cell R_5 longer than wide, clavus striped in yellow and black, *C. salicis* Doering, 49
    Body globose or pear-shaped; cell R_5 about equal in length and width; variously patterned 13
13. Body obovate, tapering at both ends equally; entirely black above, *C. hyperici* Gib.,
    Body pear-shaped, widest posterior to middle; black, variously marked above with yellow and brown 14
14. Broad, with elytra greatly inflated; front approximately equal to length of vertex; black band on postclypeus two-thirds or three-fifths its length 15
    Semielongate, pear-shaped, elytra moderately inflated; front not more than two-thirds length of vertex; black band on postclypeus usually not more than one-half its length 16
15. Yellow and black striped species ..... *C. saint-cyri* var. *saint cyri* Prov., 46
    All black above with brownish-hyaline apex ..... *C. saint-cyri* var. *anceps* McAtee, 47
16. All yellow or washed in smoky hyaline ..... *C. proteus* var. *proteus* Fitch, 40
    Mostly black or marked with black 17

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17. Base of clavus yellow ..... *C. proteus* var. *nigricollis* Fitch, 41
All black above except for yellow bands on head and pronotum and hyaline apex, *C. proteus* var. *osceola* Ball, 43

18. Face entirely yellow or brown.....19
Face yellow, variously marked with dark.....21

19. Testaceous yellow, pronotum olive-green.....20
Mostly black marked with pale yellow..... *C. testacea* Fitch (male), 60

20. Pronotal wrinkles deep, numerous, very irregular; apical callous light, *C. osborni* Gill and Bak., 56
Pronotal wrinkles less deep, regular, numbering about twenty-five on median line; apical callous dark ..... *C. testacea* Fitch (female), 60

21. Pronotal wrinkles irregular, deep; body tapering posteriorly; striking black and yellow species ..... *C. distincta* n. sp., 54
Pronotal wrinkles regular, moderately deep; body not particularly tapering posteriorly; color pattern varied.....22

22. Very small, less than 4 mm. in length, *arborina* and *newporta* sometimes excepted..23
Larger, always 4 mm. or over in length.....27

23. Uniformly dark brown or tannish-brown.....24
Fuscous-tan with a more or less distinct white band on clavus.....25

24. Uniformly dark brown ..... *C. xanthocephala* var. *xanthocephala* Germ., 76
Yellowish-brown ..... *C. xanthocephala* var. *unicolor* Fowler, 77

25. More slender with margins of elytra distinctly parallel; yellow band on pronotum obscure ..... *C. media* n. sp., 99
More robust; yellow band on pronotum very distinct.....26

26. Smaller, brown bands on pronotum and elytra very distinct, standing out in sharp contrast; front sometimes longer than vertex..... *C. arborina* n. sp., 94
Larger, more robust; more golden in color with brown markings less prominent; front generally equal to length of vertex..... *C. newporta* n. sp., 100

27. Front at least two-third's length of vertex.....28
Front less than one-half length of vertex.....31

28. Fuscous and brown with usually a faint oblique band across clavus and other dark brown marks on elytra; wrinkles numbering usually between sixteen and twenty 29
Uniformly pale yellow with no dark markings on elytra; wrinkles numbering approximately twenty-three on median line..... *C. canyonensia* n. sp., 80

29. Pronotum entirely yellow; elytra lighter tan or fuscous with markings and apical veins dark brown in sharp contrast; band on postclypeus and spots on genæ smaller ..... *C. juniperina* Ball, 97
Pronotum banded with dark; elytra brownish-fuscous, veins and markings not particularly prominent; band on postclypeus and spots on genæ large, occupying central portion of face.....30

30. Pronotum with three brown bands..... *C. ovata* n. sp., 90
Pronotum with middle brown band lacking..... *C. siskiyou* n. sp., 92

31. Posterior half of face black or sometimes mottled preceded by five or six pairs of arcs on postclypeus.....32
Face yellow with a dark band across middle preceded by several pairs of dark arcs 34

32. Elytra fuscous-brown with an oblique white band across clavus.....33
Elytra uniformly bronze fuscous..... *C. obtusa* var. *tristis* Van Duzee, 66

33. Elytra very dark fuscous-brown with a very distinct white claval band, *C. obtusa* var. *borealis* Ball, 67
Elytra fuscous, mottled, with white claval band much less distinct, sometimes only barely discernible ..... *C. obtusa* var. *obtusa* Say, 65

34. Pronotum uniform yellow without brown markings; no white band indicated on elytra 35
Pronotum yellow with usually two or three brown bands present or at least indicated; a white band across clavus.....36

35. Elytra light yellow mottled faintly with fuscous; band and arcs on postclypeus abbreviated at sides ..... *C. uniformia* n. sp., 82
Elytra mostly dark fuscous except for anterior portion of clavus, which is bright tawny yellow ..... *C. achatina* Germ., 69

36. Elytra lighter fuscous-tan with markings more distinct; median brown pronotal band broader and more prominent..... *C. texana* n. sp., 79
Elytra dark brownish-fuscous; median pronotal band narrow, frequently interrupted through middle 37

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37. Usually without brown bands on anterior margins of vertex and pronotum; arcs on postclypeus very faint ..... *C. pallidocephala* n. sp., 87
Brown bands distinct on vertex and pronotum; arcs prominent on postclypeus....38
38. Brown bands on vertex and pronotum very distinct, never interrupted, *C. tricincta* n. sp., 89
Bands less distinct; median brown band on pronotum often interrupted, *C. elongata* n. sp., 84

DESCRIPTION OF SPECIES.

Clastoptera lineatocollis Stål.

(Plates III, IV, VIII, XII, XVI, XX, XXIV, XXV.)

Stal. Ofv. Af. K. Vet. Ak. Forh., p. 253; 1854.

ORIGINAL DESCRIPTION.

Patria, Cal. (St. Francisco).

Caput dilute flavescens, verticis marginibus basali et apicali lineisque transversis frontis apicem versus longitrorsum impressæ nigrofuscis. Thorax postice profunde angulato-sinuatus, medio longitrorsum carinatus, dilute flavescens, lineis pluribus transversis fuscis ornatus. Scutellum flavescens, ante medium vitta fusca, ut littera S fere formata, utrimque ornatum. Tegmina latitudine vix duplo longiora, sordide flavescente pellucida, medio fascia antrorsum angustata et abbreviata albida, anterius a linea, postice a fascia indistincta fuscis terminata, callo rotundata fere apicali ad marginem costalem nervisque apicalibus hic illic fuscis. Subtus nigro-varia. Pedes dilute flavescentes, vitta femorum maculis que tibiarum nigro-fuscis.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.9 mm. to 4.35 mm.; ♂ 2.92 mm. to 3.6 mm. Width: ♀ 2.1 mm. to 2.62 mm.; ♂ 1.8 mm. to 2.4 mm.

SHAPE. A medium-sized, semiglobose species with margins of elytra parallel and front greatly extended, but not as much as in *delicata* or *sierra*.

COLOR. A greenish-yellow species marked conspicuously with fuscous, dark brown and black. Front yellow, bordered anteriorly with brown. Vertex yellow with anterior black border usually reaching ocelli. Eyes brownish. Face yellow with dark markings as follows: The greater portion of postclypeus crossed by eight or nine pairs of distinct arcs, the last three pairs usually united to form an irregular spot or band of varying size, another band across posterior margin, usually all of anteclypeus except a light spot on each lateral margin, the antennal cavities, a black spot between eye and postclypeus and usually another below medioposterior corner of eye. Pronotum yellow or slightly greenish-yellow crossed by five to eight dark brown, slightly depressed bands, interrupted before lateral margins, the first one narrower than rest, not always indicated. Scutellum sometimes all yellow with only a narrow brown band across middle, occasionally interrupted through center, or in the darker forms this transverse band more pronounced and with two large triangular brown spots between band and base of scutellum. Elytra yellow, marked with fuscous and tannish-brown in varying degrees, clavus usually with the third anal cell more fuscous than the rest, a conspicuous blackish-brown spot at apex and the thick yellowish-white veins standing out in sharp contrast; corium either yel-

lowish-tan or sometimes fuscous-brown, chiefly hyaline on apical portion and explanate costal margin, a distinct opaque yellow spot midway on costal margin, extending mesad across corium as an irregular narrow band, the latter preceded anteriorly by a short, oblique brown band, a smaller opaque yellow spot at base of costal margin, sometimes a yellow area in cell R_3 just cephalad of apical callous, another yellow area around apical callous, veins yellow, a dark cloud anterior to inflated portion of elytron, apical callous conspicuous and black. Legs, yellow, marked as follows: Coxa of first two pairs yellow anteriorly, rest black, trochanter with a cephalic brown spot, femur with a dark brown longitudinal band usually separated at apex by a yellow spot, tibia mostly yellow with two oblique dark bands, tarsus tannish-brown with dark brown claws. Hind leg, coxa and trochanter yellow on basal half, tibia black at base, rest yellow except a brown spot cephalad and caudad of the large lateral spine, the spines brown at base and black at tip. Mesothorax black, metathorax yellow through center and blackish-brown on margins. Abdomen mottled yellow and brown.

Majority of male specimens black above, except two brownish spots on vertex, a large conspicuous white spot midway on costal margin of each wing, the clear hyaline costal cell cephalad of apical callous, and an opaque yellow area in cell first M_4 and completely surrounding the apical callous. Face entirely black, except for a yellow band across anterior margin of postclypeus and yellow mandibular sclerites; light males same general color as females.

STRUCTURAL DETAILS. Vertex slightly depressed anteriorly, anterior margin carinated. Eyes level with rest of head, the width of the head being about three and one-half times the width of one eye. Ocelli located nearer the anterior margin of vertex than pronotum, the distance between the two ocelli slightly greater than the distance between each ocellus and eye. Front extending beyond vertex the length of the latter, or sometimes only two-thirds its length. Front greatly inflated, length of postclypeus approximately two and one-half times length of anteclypeus. Scutellum approximately one-fourth longer than wide. Elytra covered by a moderately long pubescence, the length of one elytron slightly over three times its width, base of costal margin flaring slightly, then parallel-margined to base of apical third, from whence it abruptly incurves to rounded apex. Wing venation, cell R_5 about equal in length and width, cell R_3 not much smaller than cell first M_4, apical callous round and bulbous, occupying only the cephalic half of cell R_1.

External genitalia: Pygofer of female, length and width approximately equal, exceeded by ovipositor about one-sixth of its length. Male genital plates broad at base, inner margins rounding to a blunt apex, exceeded by styles by about one-fourth their length.

Internal genitalia: Lateral valve of ovipositor broad, spoon-shaped, tapering to a roundingly pointed apex, basal laterodorsal angle membranous, ninth sternite two-thirds length of valve; inner valve flat, bladelike, broader in proportion to length than in other closely related species, united on inner margins for slightly over half their length, the free apical margins bearing two conspicuous notches, the one at point of union of the two valves and the other at base of apical third, and about 60 finely pointed teeth from basal notch to apex.

COMPARATIVE NOTES. *Clastoptera lineatocollis* resembles three other species very closely, namely *C. delicata, C. lugubris* and *C. brunnea.* In color pattern *C. lineatocollis* and *C. delicata* resemble each other perhaps more closely than any of the others, the color pattern of the two in some specimens being seemingly identical. The extreme light forms of *delicata* can usually readily be distinguished because they are a light greenish-yellow with less fuscous than the *lineatocollis* specimens have. However, sometimes *delicata* also has considerable fuscous on the elytra and then they are not so easy to separate, so that other characteristics have to be used. *C. lugubris* differs from these two species in color in that it is decidedly more bronze or brownish-fuscous, with the veins and markings much more obscure. On the other hand, even in the darker forms of both *delicata* and *lineatocollis* the veins are conspicuous, thick and yellow, making a sharp contrast to rest of elytra. *Clastoptera brunnea* frequently grades into *lineatocollis* in general color although as a general rule *brunnea* is more bronze and darker, somewhat resembling *lugubris.*

The other differences in color between these species pertain to the color pattern of the face. *Clastoptera brunnea* can be separated very easily from the other three by the fact that it usually has an entirely black face, whereas that of the other three are yellow with a transverse dark spot or band and dark arcs on the postclypeus, as given in the descriptions of each. It must be noted, however, that occasionally *brunnea* has faint touches of light on the lateral margins of the postclypeus and on the genæ with sometimes the mandibular sclerites mostly all yellow. Moreover, the dark spots on the postclypeus and genæ in *lineatocollis* are usually larger in proportion to the yellow areas than they are in *delicata.* Lastly, there is another color difference which sometimes aids in separating *C. lineatocollis* and *C. delicata.* Usually *lineatocollis* has six or seven, and frequently eight, dark bands on the pronotum, while in *delicata* the usual number is five.

Structurally these species differ in several ways. *Clastoptera delicata* is the longest species of the group, with the length of the clavus extending beyond scutellum usually equal or nearly equal to the length of the scutellum, which is not true in any of the others, particularly *lineatocollis* and *brunnea* *C. delicata* also has a more pointed head, with the front protruding beyond vertex much farther than in any of the others, thus interrupting the rounding frontal curve of the head at point of union of gena and front. The postclypeus in *delicata* is greatly inflated, less in *lugubris* and *lineatocollis* and least of all in *brunnea.*

The size of these species also aids in separating them. *Clastoptera delicata* and *C. lugubris* are the two largest forms, being almost equal in size. *Clastoptera brunnea* is usually the smallest one in the group, and *C. lineatocollis* is about halfway between *delicata* and *brunnea.*

Lastly the ovipositors of these species differ notably. The inner valves of *delicata* are very long and broad, united for not quite a third of their length, the two notches are widely separated, and the margins between the basal notch and apex of each are alternately broken up into smooth areas and toothed areas, which is entirely different from any of the other species. The inner valves in *lineatocollis* are extremely short and broad, the notches are located very close together and the teeth are moderately fine and numerous, the

valve of *lugubris* is more nearly like that of *lineatocollis* than *delicata*, having practically the same number of teeth as the former, but differing from it in that the valve is longer and much more slender, with the two notches spaced somewhat further apart and the apical notch distinctly roundingly produced. This valve of *brunnea* is also a short valve, but not as broad in proportion to its length as that of *lineatocollis*, and has much finer, more numerous teeth, and a rounding groove on its inner margin just before apical notch.

The black male forms in this group may also cause confusion in trying to classify them. Black males occur in *Clastoptera lineatocollis, brunnea* and of course *sierra*, since it is an entirely black species in both sexes. The writer was unable to find males of *binotata* in any of the collections which she had on hand for study. (For further discussion of this question, see distribution notes in the description of *binotata*.) The black males of these three species mentioned above, however, can easily be separated by the following differences: *Sierra* is entirely black above and below, and therefore lacks the conspicuous white spot on costal margin and any light markings on face; *C. lineatocollis and C. brunnea* both have this white spot on costal margin present, as well as a hyaline area of varying size preceding the apical callous and a yellow margin around the latter. In turn these two can be separated from each other by the color of the postclypeus which is entirely or almost black in *brunnea* but which has a lighter, irregular band across posterior border in *lineatocollis*.

These three species may easily be confused with the males of the following species, namely: *C. xanthocephala, C. saint-cyri* var. *anceps, and C. hyperici. C. xanthocephala* resembles the black males of *lineatocollis* and *brunnea* because it also has a white spot on the costal margin of the elytron, but it can be distinguished easily enough from these as well as from *sierra* by the fact that the pronotum has numerous fine wrinkles on it, while in the others the pronota are traversed by only a few deep ones. *C. hyperici* and *C. saint-cyri* var. *anceps* can be distinguished from the *lineatocollis* group by the color pattern of the face, which in the first two is of the *proteus* type wherein the anterior portion is shining black and the posterior portion is bright yellow, while the other three have black or mostly black faces as mentioned above. Likewise *hyperici* and *anceps* both have very faint, moderately numerous wrinkles instead of the few deep ones found in the *lineatocollis* group.

DISTRIBUTION. Doctor Ball states that he has taken this species abundantly in California and occasionally in Utah. In addition to these states they have been taken abundantly in Arizona and one specimen in the National Museum collection bears a Texas label. Another single specimen was taken in Eddy county, New Mexico. In the Snow collection, University of Kansas, there is a large series of 552 specimens. The majority of this large series were taken in Mescal, Cochise county, a few in Coconimo county, and a few in the Santa Rita mountains, Arizona.

Of this large series 363 were females and 189 were males. In the males there were 158 black forms and 31 light ones.

HOSTS. Doctor Ball states that this species is taken abundantly on sage brush and mint in California.

Clastoptera delicata Uhler.

(Plates III, IV, VIII, XII, XVI, XX, XXIV, XXV.)

Clastoptera delicata Uhler. Uhler, P. R. Bul. U. S. Geol. Surv. I, p. 348; 1875.
Clastoptera delicata subsp. *binotata* Ball. Ball, E. D. Proc. Ia. Acad. Sci. III, p. 184; 1895.
Clastoptera lineatocollis var. *delicata* Uhler. Ball, E. D. Can. Ent. LIX, p. 105; 1927.

ORIGINAL DESCRIPTION.

Form of *C. proteus* Fitch, but with a more prominent front. Pale greenish-yellow. Head broad, apparently impunctate; cranium short, transversely depressed, as is also the tylus; anterior edge of the vertex carinately elevated, bordered from eye to eye with a black line; eyes margined behind with black; front smooth, polished, bright yellow, rounded, the transverse rugæ substituted by slender black bands; lower down grooves, and with a broad, black spot, adjoining which each side on the cheeks is a smaller spot; under side bright yellow, rostrum black, reaching almost to the posterior coxæ; antennæ black at base. Pronotum banded on the anterior edge by a slender black line, and with five straighter and more slender lines, which stop just short of the lateral margins, these lines feebly impressed, and obsoletely, minutely scabrous; surface not wrinkled, almost smooth, moderately convex, deeply emarginated behind, the lateral margin narrowly produced as far as the outer line of the eyes; the humeral margin recurved, and with a small black dot before it. Scutellum pubescent, yellow, transversely wrinkled, with a slender black line at base and an interrupted one behind the middle. Hemelytra with a short, remote, golden pubescence, coarsely punctate at base, more obsoletely so posteriorly; the inner and posterior margins, the suture between the corium and clavus, an oblique short streak on the disk, and a spot on the middle of the costa fuscous; posterior margin of the corium with a sinuous brown band, the membrane and posterior one-third of the corium and a spot at base of costa pale brown, the bulla very prominent, black, under side yellow; the mesostethium, disks of the pleural pieces, and the middle line of the genital segment pitch-black. Legs yellow, the tibiæ having a band below the knee, another on the middle, and a third at tip and the spines of tibiæ and tarsi, including the nails, dark piceous.

Length to tip of hemelytra, 4½ mm.; width of pronotum, 2 mm.

Colorado and Utah.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.5 mm. to 4.95 mm.; ♂ 3.6 mm. to 3.9 mm. width: ♀ 2.47 mm. to 2.77 mm.; ♂ 2.1 mm. to 2.32 mm.

SHAPE. A large, semielongate species, tapering somewhat posteriorly and with a greatly protruding front.

COLOR. Greenish-yellow, marked conspicuously with dark brown and fuscous. Front yellow, crossed by three pairs of faint dark brown arcs. Vertex yellow, a black band across anterior margin reaching ocelli. Eyes golden-brown. Face yellow, marked with dark as follows: Nine or ten pairs of dark brown arcs and a posterior band across postclypeus, anteclypeus dark brown through middle, sometimes the posterior two or three pairs of dark arcs on postclypeus fusing together to form a dark spot, occasionally entire lower half of postclypeus and all of anteclypeus shining brownish-black. Pronotum bordered

anteriorly by an irregular dark band, broadest through middle and narrowed at eyes, the disk crossed by four or five conspicuous dark brown bands, interrupted before lateral margins, and usually a shorter, fainter band just back of anterior border, sometimes, also, one to three faint lines or wrinkles on each posterior lobe. Scutellum yellow with a slender black line at base and another just behind middle, both usually interrupted through middle, sometimes in the darker specimens a conspicuous sinuate dark line on each side connecting the two transverse bands. Elytra yellowish-green and brownish-fuscous, clavus mostly yellow with the central areas of cells, an elongate spot on elytral margin laterad of each pronotal posterior lobe, and a large spot at apex light brownish-fuscous in the lighter forms, or extremely dark fuscous in the darker ones, with the thick, yellow veins greatly accentuated; corium yellow on basal two-thirds marked with light brown or deep fuscous as follows: A spot on costal margin just before middle becoming an oblique transverse band across middle, a border along the claval suture and a large cloud just before inflated portion of elytron, apical third clear tannish-hyaline except for the thick yellowish-white veins, the dark brown apical callous, surrounded by opaque yellow and an elongate thickened brown spot just anterior to cell M_2. Legs yellow, coxa of first two pairs with a dark band across middle, a dark spot on trochanter, a longitudinal brownish band on femur, a black band below knee of tibia, another on middle and a third at apex, sometimes a longitudinal band connecting these oblique bands, tarsus yellow or washed in brown with blackish-brown claws. Hind legs yellow with brownish, black-tipped spines, sometimes a brownish spot on femur and the tibia as above except for a yellow spot around larger lateral spine which divides the middle dark band. Mesothorax shining black through middle with yellow lateral margins. Metathorax yellow except for black lateral margins. Abdomen yellow, sometimes anterior segments dark and rest margined anteriorly with black, ovipositor always black.

Males resembling females in general color pattern.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin carinated. Eyes, length somewhat less than one-fourth the width of head. Ocelli located nearer anterior margin of vertex than pronotum and distance between the two ocelli equal to distance between each ocellus and eye. Front transversely depressed, greatly extended beyond vertex as much or usually more than length of vertex, the anterior curve of head interrupted at point of union of gena and front as in *C. sierra.* Postclypeus greatly inflated, its length approximately two and one-half times that of the anteclypeus. Pronotum minutely pitted, crossed by four, five or six depressed bands on median lines, commonly five, the first usually much shorter and less distinct, the sixth one, if present, merely a deep wrinkle instead of a band, usually one to three wrinkles on each posterior lobe, the first one sometimes a short, broad band instead of a wrinkle. Scutellum, length approximately two-fifths greater than its width. Elytra covered by a moderately fine pubescence, the length of one elytron approximately three times its width, base of costal margin flaring, then parallel-margined to apical half of elytron, from whence they taper to a bluntly pointed apex, length of clavus beyond apex of scutellum approximately equal to length of scutellum itself. Wing venation, cell R_5 about equal in length and width, cell R_3 much shorter than cell first M_4, apical callous round, bulbous, occupying about half of cell R_1.

External genitalia: Pygofer of female slightly wider than long, exceeded by ovipositor by one-seventh of its length. Male plates broad, divided on inner margins for about one-half their length, their mesocaudal angle bluntly rounded, exceeded by genital styles by about one-third their length.

Internal genitalia: Lateral valve broad, spoon-shaped tapering to a bluntly pointed apex, its laterodorsal margin membranous for half its length, ninth sternite approximately three-fourths its length; inner valve flat, blade-like, long, tapering to a pointed apex; the two valves united on inner margins for one-third their length, the free margins bearing fine teeth at scattered intervals and two conspicuous protruding notches, one at point of union of the two valves, the other at base of approximate apical third. Male styles broad, stout, basal apex extended into a flap, apical fourth at base bearing laterally a sharply pointed recurved hook, from whence it tapers to a dorsad-curving sharply pointed apex.

COMPARATIVE NOTES. See discussion of this subject under this heading in the description of *Clastoptera lineatocollis*.

DISTRIBUTION. Specimens have been collected from the following states: Arizona, California, Colorado, New Mexico and Utah. A large series of thirty-five or more specimens were taken by Doctor Lawson and Doctor Beamer at Pawnee Buttes, Colo. Another large series of about sixty specimens were collected by Doctor Beamer and Doctor Readio at Williams and in the Grand Canyon, Arizona. In all, the writer had available for study about 130 specimens, of which only 13 were males, a fact which indicates that the males of this species are rare.

HOSTS. Doctor Ball states that this "species is abundant on rabbit brush (*Chrysothamnus graveolens*) in sheltered locations in Colorado and to a less extent on the sage brush in the western areas." Doctor Beamer and Doctor Lawson found the specimens taken at Pawnee Buttes on the rabbit brush mentioned by Doctor Ball. In New Mexico and Arizona Doctor Beamer noted that they were taken on a sagelike plant, which again checks with Doctor Ball's data.

Clastoptera brunnea Ball.

(Plates III, IV, VIII, XII, XVI, XX, XXIV, XXV.)

Clastoptera lineatocollis var. *brunnea* Ball. Ball, E. D. Ia. Acad. Sci. XXVI, p. 147; 1919.

ORIGINAL DESCRIPTION.

Smaller and less distinctly marked than *delicata*. Smaller than typical *lineatocollis* with less of a smoky and more of a bronzy cast, the lines and markings present, but obscure; face shining black.

Described from four examples from Alder and Rifle, Colo., collected by the writer. The smaller size and shining black face will at once distinquish this variety from the *lineata* relatives.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.45 mm. to 3.75 mm.; ♂ 3 mm. to 3.3 mm. Width: ♀ 1.95 mm. to 2.32 mm.; ♂ 1.87 mm. to 1.95.

SHAPE. A small, parallel-sided species with elytra only slightly inflated.

COLOR. Fuscous-bronze and yellow, marked with dark brown or black, very similar in appearance to *C. lineatocollis* and *C. lugubris*. Front, vertex, pronotum and scutellum as in the darker females of *lineatocollis*. Face outstandingly different from other closely related species by being entirely shining black, or occasionally with six or seven pairs of yellow arcs indicated on extreme lateral margins of postclypeus, mandibular sclerites sometimes yellow and sometimes touches of yellow around eyes or outlining a black spot on gena between postclypeus and eye and another just beneath caudomesal angle of eye. Elytra marked as in *lineatocollis* excepting that the clavus usually is more bronze-fuscous than in the latter, with the veins and markings less distinct. Rest of the body as in *lineatocollis* excepting that the dark areas are more accentuated.

Males of this species of two forms, the light ones resembling the females in color pattern and dark forms, entirely black above and below except for a yellow border around apical callous, preceded by a hyaline area and sometimes metathorax yellowish.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Eyes, length approximately one-fourth total width of head. Ocelli located nearer anterior margin of vertex than pronotum and distance between the two ocelli less than distance between each ocellus and eye. Front extended beyond vertex only one-half or two-thirds length of latter, less than in other closely related species. Postclypeus moderately inflated, its length approximately three times length of anteclypeus, its width about one-half greater than distance between its lateral margin and outer margins of head. Pronotum crossed by six to eight distinct, slightly depressed dark bands, interrupted before lateral margins, anterior margin roundingly produced, lateral margins short and not greatly diverging, posterior margin deeply emarginate. Scutellum approximately twice as wide as long. Elytra approximately two and one-half times as long as wide, base of costal margin slightly flaring, then parallel-margined to base of apical fourth from whence it abruptly incurves to rounded apex. Wing venation, cell R_5 about equal in length and width, cell R_3 smaller than cell first M_4, apical callous round, bulbous, occupying only part of cell R_1.

External genitalia: Pygofer of female slightly wider than long, exceeded by ovipositor approximately one-fifth of its length. Male plates broad at base, inner margins rounding to blunt apex, exceeded by styles about one-fifth or one-fourth their length.

Internal genitalia: Lateral valve of females broad, spoon-shaped, tapering to a bluntly pointed apex, its laterodorsal margin membranous for half its length, ninth sternite approximately three-fourths its length, inner valve flat, bladelike, rather broad and short but not as much as in *lineatocollis*, the inner margins united for half their distance, the free margins bearing fine, pointed teeth, numbering about one hundred and fifteen and two notches, the first at point of union of the two valves and the other just anterior to apical two-fifths, a deeply rounding groove cephalad of apical notch.

Male styles broad and stout, basal apex extended into a flap, apical fourth at base bearing laterally a recurved hook; from whence it tapers to a dorsad-

curving, sharply pointed apex; connective roughly triangular; œdagus very short and broad, not much longer than connective itself.

COMPARATIVE NOTES. See discussion under this heading in the description of *lineatocollis*.

DISTRIBUTION. Specimens have been collected from Arizona, California, Colorado, Nevada, North Dakota and Utah.

LOCATION OF TYPES. Collection of Dr. E. D. Ball, Sanford, Fla.

HOSTS. Doctor Ball (1927) states: "The writer has taken this form commonly on sage brush (*Artemisia tridentata*) and in smaller numbers from rabbit brush on the western slope of Colorado, throughout Utah, and a few examples in the Bad Lands of North Dakota. Dr. J. McDunnough reports this from Lilloet, B. C., on sage brush."

Clastoptera lugubris Ball.

(Plates III, IV, VIII, XII, XVI, XX.)

Clastoptera lineatocollis var. *lugubris* Ball. Ball, E. D. Ia. Acad. Sci. XXVI, p. 146; 1919.
Clastoptera lineatocollis var. *lugubris* Ball. Ball, E. D. Can. Ent. LIX, p. 106; 1927.

ORIGINAL DESCRIPTION.

Size and form of var. *delicata*, but lacking its definite marking. Dull smoky-brown with faint indications of the transverse bands on vertex and pronotum. A dark, smoky cloud just before the inflated portion of elytra and a large, shining black callosity. Face shining black.

Described from a single female from Alameda county, California, in the collection of the writer. Other examples from the same locality vary in having broader bands on the pronotum and the face with traces of light lines.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.65 mm. Width: ♀ 2.77 mm.

SHAPE. A large, semiglobose species with the front greatly extended.

COLOR. Dark tan or brown marked with yellow and dark brown. Front, deep yellow, with a dark brown band across anterior portion formed by the union of two pairs of dark arcs.. Vertex deep yellow with a black band along anterior margin. Eyes gray-brown. Face, postclypeus yellow with eight or nine pairs of conspicuous dark brown arcs on anterior two-thirds, the posterior three pairs united through middle, thus forming a partial transverse band; another solid brown band on posterior margin, all of anteclypeus, a dark spot on gena, another beneath mediocaudal angle of eye and the antennal sockets dark brown. Pronotum dark tan with an uneven black border along anterior margin, disk crossed by seven or eight broad dark brown stripes, with the space between them more greenish in color and a brown spot on each lateral angle. Scutellum yellow with a dark spot at each basal-lateral angle, another midway down on each lateral margin, and a large median dark V. Elytra, clavus mottled with brown and fuscous, the third anal cell darker than the rest, veins yellow, greatly accentuated; corium tannish-brown, becoming clear hyaline towards apex, with a dark brown spot at base of costal margin, another midway down on costal margin, followed by a conspicuous yellow-white spot, which extends mesad almost to claval suture as a narrow white line, the latter

bordered anteriorly by a distinct oblique dark brown band, posteriorly by a large, dark cloud, the large apical callous brownish-black. Legs yellow, conspicuously marked in dark brown as follows: Coxa of first two pairs yellow anteriorly, solid black posteriorly, trochanter with a cephalic brownish spot, femur with a dark brown spot on cephalic surface separated at apex by a yellow spot, tibia mostly dark brown on cephalic surface, except for two oblique yellow bands, tarsus tannish-brown with dark brown claws. Hind leg with coxa and trochanter yellow, femur, excepting posterior half, yellow, tibia yellow excepting the black base, a brown spot cepalad and caudad of lateral spines, and the lateral and apical spines which are brown at base and black at tip, tarsus yellow, with spines black at tip. Mesothorax black. Metathorax black on anterior portion, rest yellow. Abdomen with anterior segments black, caudal segments yellow, margined in black, pygofer and ovipositors mottled in brown and yellow.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin not distinctly carinated. Length of eye slightly over one-fourth the width of the head. Ocelli located nearer anterior margin of vertex than pronotum and the distance between the two ocelli being somewhat wider than distance between each ocellus and eye. Front extending beyond vertex more than length of vertex. Face, postclypeus moderately inflated, its length about two and one-half times length of anteclypeus, its width about one-third greater than distance between its lateral margin and outer margin of head. Scutellum two-fifths longer than wide. Elytra, their surface covered by relatively long hairs, length of one elytron approximately two and one-half times its width, base of costal margin flaring, then parallel-margined to apical third of elytron, from whence it abruptly incurves to rounded apex. Wing venation, cell R_5 length and width equal, cell R_3 smaller than cell first M_4, apical callous large and bulbous, occupying most of cell R_1.

External genitalia: Pygofer of female, length and width almost equal, exceeded by ovipositor about one-tenth or one-eleventh of its length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly pointed apex, its mediobasal half membranous, the ninth sternite about two-thirds the length of the valve; inner valve flat, bladelike, the inner margins of the two valves united for slightly over half their distance, with a small notch at point of union of the two valves and a more prominent protruding notch at base of apical third, and the free margins bearing approximately eighty-nine teeth.

COMPARATIVE NOTES. See the discussion under this heading in the description of *lineatocollis*.

DISTRIBUTION. Doctor Ball states that this species is known only from southern California.

LOCATION OF TYPES. Collection of Dr. E. D. Ball, Sanford, Fla.

Clastoptera binotata Ball.

(Plates III, IV, VIII, XII, XVI, XX.)

Clastoptera delicata subsp. II *binotata* Ball. Ball, E. D. Proc. Ia. Acad. Sci. III, p. 185; 1895.
Clastoptera binotata Ball. Baker, C. E. Notes on Cercopidæ, Ent. News; 1900.
Clastoptera lineatocollis var. *binotata* Ball. Van Duzee, E. P. Cat. Hemip.; 1917.
Clastoptera lineatocollis var. *binotata* Ball. Stearns, L. A. Hemip. Conn., p. 233; 1923.
Clastoptera lineatocollis var. *binotata* Ball. Ball, E. D. Can. Ent. LIX, p. 106; 1927.

ORIGINAL DESCRIPTION.

Size variable; color from yellow to black; front much inflated; two circular yellow depressions on vertex near eyes; pronotum strongly, broadly wrinkled.

Front rising abruptly from face at sides, meeting vertex in same plane above, outline a regular curve. Vertex very slightly transversely depressed; a distinct, circular, yellow depression midway between eye and ocellus on either side. Pronotum coarsely pubescent, strongly, transversely wrinkled, about eight on the median line. Hemelytra coarsely pubescent; veins on clavus strongly raised; apical cells transversely compressed, third cell triangular, not reaching beyond angle of posterior marginal vein. Legs stout; spurs and spines strong; femur and tibia with dark lateral lines coalescing with two dark spots on outside of tibia.

Subsp. I, *lineata*. Pronotum yellow, with five black bands. Subsp. II, *binotata*. Pronotum entirely black.

HABITAT. Utah (Uhl.), California, Colorado and Arizona.

NOTES ON SYNONYMY.

In 1895 Doctor Ball called this form a variety of *delicata* Uhler. At this time he stated that this variety had been given the manuscript name, *Clastoptera binotata*, by Uhler. It was distributed under this name in collections.

In 1900 Mr. Baker pointed out that this should not be a variety, but a distinct species. He says: "I regard it as a good species. Among other things the pronotum in *binotata* is opaque and broadly, shallowly wrinkled, in *delicata* (*lineatocollis*) it is shining and nearly smooth. *Binotata* is further distinguished by the coarser sculpturing of the clavus. A variety of *binotata* occurs in California having a greater extent of light coloring along the costa and a transverse light band across lower part of face."

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.75 mm. to 4.05 mm. Width: ♀ 2.17 mm. to 2.47 mm.

SHAPE. A medium-sized blunt species with elytra only slightly inflated and margins distinctly parallel.

COLOR. A blackish-brown species with a conspicuous white spot on each wing. Head black with two light brown spots on vertex, and grayish-brown eyes. Face, all black crossed by five or six pairs of yellow arcs on the anterior half of postclypeus and sometimes a faint spot in center of dark part. Scutellum black. Elytra black at base, brownish on explanate costal margin and apical third, with a conspicuous white spot midway on costal margin. Metathorax yellow. Abdomen black or blackish-brown. Legs yellow marked with brown as follows: Coxa of first two pairs dark brown, trochanter yellow washed in

brown, femur yellow with a narrow longitudinal brown stripe on cephalic surface, tibia yellow with two oblique brown spots on cephalic surface, tarsus yellow with apices of segments margined in brown, claws dark brown. Coxa and trochanter of hind legs yellow, femur yellow except for the basal portion, a longitudinal narrow stripe lengthwise of each, and apical portion brown, tibia yellow with a brown spot at base, another between the two lateral spines and a third just caudad of second spine, the spines yellow at base and black at tip, tarsal segments washed in brown, with extreme tips of spines and tarsal claws very black.

STRUCTURAL DETAILS. Vertex not transversely depressed, anterior margin slightly carinated. Length of eye one-fourth the width of the head. Ocelli located half way between anterior and posterior margins of vertex, the distance between the two ocelli equal to distance between each ocellus and eye. Front extending beyond vertex about two-thirds the length of vertex, the anterior curve of head evenly rounded. Postclypeus moderately inflated, not as much as in *sierra*, its length almost three times the length of anteclypeus, its width about twice the distance between its lateral margin and outer boundary of head. Pronotum, roundingly produced anteriorly, lateral margins greatly diverging, posterior margin deeply emarginate, its surface roughly checked, also crossed by seven or eight deep wrinkles along median line and more at sides. Scutellum, length one-fourth greater than width. Elytra, approximately two and one-half times as long as wide, base of costal margin flaring, then parallel-margined to apical fourth of wing, from whence it abruptly incurves to blunt apex, their surface covered by moderately fine, short pubescence. Wing venation, cell R_5, trifle longer than wide, cell R_3 smaller than cell first M_4, apical callous very large, bulbous, occupying basal two-thirds of cell R_1.

External genitalia: Pygofer of female somewhat wider than long, exceeded only slightly by ovipositor by about one-thirteenth of length of latter.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, rounding to a bluntly pointed apex, its basal laterodorsal angles membranous, ninth sternite approximately two-thirds the length of the valve; inner valves flat, bladelike, tapering to a bluntly pointed apex, their inner margins united for half their length, their free margins bearing about ninety-three distinct teeth and two notches, the smaller one at point of union of the two valves and the other at base of apical third.

COMPARATIVE NOTES. *Clastoptera binotata* resembles *Clastoptera sierra, Clastoptera saint-cyri* var. *anceps, Clastoptera hyperici* and *Clastoptera xanthocephala,* since all of these are more or less black or blackish-brown. It is distinguished from *sierra* by the fact that the latter has no yellow markings, while *binotata* has six or seven light arcs on the postclypeus and a whitish-yellow spot midway on costal margin of each elytron. Moreover, the general shape of the body is somewhat different, *sierra,* being a larger, more inflated species, with the elytral margins greatly diverging and the front considerably extended, while *binotata* is a more blunt species, with the elytra less inflated and the margins distinctly parallel. *Binotata* differs from *saint-cyri* var. *anceps* chiefly in that it is larger and has all black elytra and face while *anceps* has the apex of elytra light brown and the posterior half of postclypeus bright

yellow. *Binotata* also resembles *hyperici,* but differs in that the lower half of the postclypeus in *hyperici* is bright yellow, while in *binotata* the face is entirely black, with five or six pairs of light arcs on the anterior half of the postclypeus. Moreover *binotata* has the two white spots on the elytra, which are entirely lacking in *hyperici.* Lastly, superficially *binotata* resembles *C. xanthocephala,* since they are both dark colored species and their general shape is similar, both having parallel-sided elytra which are bluntly tapered at apex. They can be distinguished by the general color, which in *xanthocephala* is blackish brown while *binotata* is more black, and by the color of the postclypeus, which in *xanthocephala* is yellow with a dark transverse band across middle, preceded anteriorly by dark arcs, while in *binotata* the postclypeus is all black except for the anterior light arcs. Then *binotata* differs from these last three species very decidedly in the pronotal wrinkles, *binotata* having a few very deep wrinkles, *Clastoptera hyperici* and *Clastoptera saint-cyri* var. *anceps* comparatively few but exceedingly shallow ones, while *xanthocephala* has many shallow wrinkles.

The ovipositors of these five black or blackish-brown species furnish another good distinguishing character. The inner valve of *sierra,* which of course more closely resembles that of *binotata* since they belong in the same large group, is much longer and more slender than that of the latter, with the distance from apical notch to apex of valve proportionally shorter, and with two other notches indicated cephalad of it instead of just one as in *binotata;* moreover, the teeth of *sierra* are larger and less in number than in *binotata,* there being about 93 in the latter and 68 in the former. The differences in the valve of the other three can easily be seen by a glance at the figures; *hyperici* has a short, broad valve with apical notch almost entirely lacking; the var. *anceps* has a longer but also a broad valve with the two notches widely separated, and *xanthocephala* has a very small valve with the notches only slightly indicated. The teeth in *hyperici* and *xanthocephala* are fine, numbering about 110 in the former and about 78 in the latter, while in *anceps* they are larger, numbering about 108.

For discussion of the males of related species see page 23.

DISTRIBUTION. Doctor Ball states that this species "occurs from the Rocky Mountains in Colorado, west to California and southward. Common on the sagebrush." However, since there has been so much confussion in regard to the black males of this group it is possible that some of the males of *Clastoptera sierra* and *lineatocollis* have been confused with this species.

The writer is inclined to believe that no males of *binotata* have been collected. Just how they would differ from those of *sierra* it is hard to determine. As Doctor Ball suggests, the best way, perhaps, would be to depend on locality labels which show that males and females have been taken together, and that no other species was confused with it.

In regard to this question Doctor Ball (1927) stated: "The males of *binotata* are much smaller and have the face all black, and may lack the light markings along costa." In a letter to the writer he also made these remarks: "The only way that I have of placing the black males of all varieties, except *delicata* is that they have been collected with the females where only the one variety was found in the place. Most of my collecting was done before the

varieties were differentiated, and there should be a considerable amount of study in the field of the relationship of these forms, and especially of the relation of the sexes. Males of *delicata* are almost always scarce, while on the other hand the black males of *brunnea* and *lineatocollis* are abundant. As the black females of *binotata* are themselves rare, and have been rarely taken where they are free from possible contamination with the other forms, it is difficult to segregate their males."

LOCATION OF TYPES. Holotype and allotype in the collection of Dr. E. D. Ball, Sanford, Fla.

HOSTS. Sage brush.

Clastoptera sierra sp. new.

(Plates III, IV, VIII, XII, XVI, XX, XXIV, XXV.)

SIZE. Length: ♀ 4.65 mm. to 4.8 mm.; ♂ 3.75 mm. Width: ♀ 2.7 mm. to 3.3 mm.; ♂ 2.4 mm.

SHAPE. A large, robust species. Males much smaller, approximating the size of the females of *lineatocollis* and *brunnea*.

COLOR. An entirely black or brownish-black species, except for two light brown spots on vertex and the golden-brown eyes. Elytra black, becoming reddish-black on distal portion. Mesothorax black. Metathorax light. Abdomen and legs black.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly elevated. Eyes with their greatest length less than one-fourth the width of the head. Ocelli located slightly nearer anterior margin of vertex than pronotum, the distance between the two ocelli equal to the distance between each ocellus and eye. Front extending beyond vertex a distance approximating the length of the vertex. Postclypeus greatly inflated, length about three times the length of the anteclypeus. Pronotum rough, anterior margin roundingly angulate, lateral margins greatly diverging, posterior margin deeply emarginate, anterior portion of pronotum and head at an angle with rest of body, wrinkles across disk few and deep, numbering about ten along median line. Scutellum roughly wrinkled and pitted, its length about one-half of width. Elytra greatly inflated, length of one slightly more than twice its width, base of costal margin flaring, then only slightly diverging to apical third of elytron, from whence it abruptly incurves to rounded apex, its surface roughly wrinkled, covered by a moderate number of short hairs. Wing venation, cell R_5 equal in length and width, cell R_3 smaller than cell first M_4, the apical callous large, bulbous, occupying most of cell R_1.

External genitalia: Female pygofer longer than wide, exceeded by ovipositor about one-fifth of its length. Male plates broad at base, inner margins rounding to a blunt apex, exceeded by genital styles about one-third or one-fourth their length.

Internal genitalia: Lateral valve of ovipositor broad, spoon-shaped, tapering to a bluntly pointed apex, the basal two-fifths membranous on dorsolateral angle, the ninth sternite over half the length of the valve. Inner valve flat, bladelike, narrow, tapering to a roundingly pointed apex, the basal half of the two valves united, the free apical margins bearing three notches, one at point of union of the two valves, another at base of apical third, and the

other one-half way between these two, the margin from the apical notch to apex of valve bearing distinct teeth, numbering approximately 68. Male styles broad and stout, basal apex extended into a flap, apical fourth at base, bearing laterally a recurved hook, from whence it tapers to a dorsad-curving, sharply-pointed apex; connective roughly triangular, about twice as wide as long. œdagus a straight rod with rounded apex, in situ the apical portion being bent dorsad.

COMPARATIVE NOTES. *C. sierra* superficially resembles other black species in the genus, but differs from all of them by the fact that it is entirely black above and below. It is thus separated from *hyperici,* which is also chiefly black above because the latter has the lower half of face bright yellow. Moreover, *hyperici* has very shallow wrinkles on the pronotum while *sierra* has only a very few but decidedly deep ones.

For the comparison with *binotata,* see the discussion on page 31 under this heading; and for comparison with the males of other black species, see the discussion on page 23 in the description of *lineatocollis.*

DISTRIBUTION. The species was described from eight specimens in the National Museum collection, collected by Coquillett and C. F. Baker. Four females and three males of this series were collected at Sierra Nevada, Cal., and another male was taken at San Bernardino, Cal.

LOCATION OF TYPES. Holotype and allotype in the National Museum collection, Washington, D. C.

HOSTS. Unknown.

Clastoptera proteus Fitch.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Fitch, Asa. Homoptera. New York State Cabinet of Natural History, p. 53; 1851.

ORIGINAL DESCRIPTION.

Head bright yellow, a black band on anterior margin of the vertex and a broader one on the front; front polished, without transverse striæ; a callous black dot near the apex of the elytra; legs yellowish-white, tarsi black. Length, 0.16; males slightly smaller. Abundant on the panicled dogwood (*Cornus paniculata*). Closely allied to *C. atra* (Germar), but on examining a host of specimens not one occurs in which the legs are annulated with black or fuscous. No. 722, female.

This pretty insect, though so small in size, presents an astonishing number of subspecies and varieties so clearly and distinctly marked that at first glance they would be confidently regarded as well characterized species. The following are the more prominent, though by no means all, of the varieties that occur:

Subspecies I—*flavicollis.* Thorax entirely yellow.
- var. *a*—Elytra yellow. No. 723.
- var. *b*—Elytra with an oblique, blackish vitta. No. 724.

Subspecies II—*cinctocollis.* Thorax with a black band.
- var. *a*—An interrupted black band on anterior margin of the thorax. No. 725.
- var. *b*—An entire black band on anterior margin of the thorax. No. 726.

Subspecies II—*cinctocollis*—Concluded.

var. *c*—Thoracic band crossing the disk instead of the anterior margin. No. 727.

var. *d*—Band on the disk of the thorax, and scutel black. No. 728.

Subspecies III—*maculicollis*. Thorax with one or two discoidal spots.

var. *a*—A black spot on the disk and interrupted band anteriorly. No. 729.

var. *b*—A black spot on the disk and anterior band entire. No. 730.

var. *c*—Two black spots on the disk of the thorax. No. 731.

Subspecies IV—*nigricollis*. Thorax black, with a yellow band forward of the disk.

var. *a*—The black band on anterior margin of thorax interrupted. No. 733.

var. *b*—The band continuous. No. 734.

var. *c*—Scutel black, with a yellow dot at its base. No. 735.

var. *d*—Scutel entirely black. No. 736.

AUTHENTICITY OF THE FITCH TYPES.

Clastoptera proteus and its many subspecies and varieties, described by Fitch in 1851 have been, for some reason, the source of much confusion to systematists in this group ever since that time. In the literature one can scarcely find any two writers agreeing on any one form. Moreover a number of mistakes in nomenclature have been made. The result is that the group has been woefully mixed up from beginning to end. It would appear, then, that the first and easiest thing to do in settling the question would be to study the Fitch types themselves. However, this does not prove to be the simple task it at first seems to be. In the first place there has been some misunderstanding in regard to the location of the Fitch types. The National Museum authorities are inclined to believe that they are found in the National Museum collection, while others maintain that they are to be found in the Albany State Museum. This question has been investigated by Dr. Herbert Osborn quite thoroughly. In a letter to the writer he remarks:

"My opinion is that where the numbers on the specimens agree with the numbers in Fitch's published description they should be types, although where specimens in the National Museum agree with those at Albany there would of course be no debate as to what the species is. The National Museum set was, as I understand it, a duplicate set kept by Doctor Fitch, and after his death sold with other material, and finally acquired by the National Museum. In some respects it might be thought more authentic than the set deposited in Albany, but the fact is that for many of the species, at least, the numbers given in the descriptions coincide precisely and references to sexes agree with the specimens in Albany. In such cases there seems little room for doubt that the Albany specimens were the ones actually used for description."

On the case containing the types at Albany is pasted a label which Dr. E. P. Felt states was placed there by Mr. Lintner. The wording of this label is as follows: "Arranged by Doctor Fitch in 1850. Transferred to this case in 1879. Contains 575 species and 5 subspecies of types of Doctor Fitch."

Furthermore, in Lintner's Ninth Report of the State Entomologist of New York, which contains a copy of Fitch's original paper, Lintner gives the following explanation as a preface to the latter:

"The case of Homoptera, arranged by Doctor Fitch to accompany and illustrate the catalog—each specimen indicated by name and number cut from the catalog—was placed in the collections of the New York State Cabinet of Natural History in 1850. During ensuing years it became infested with *Anthrenus* and other museum pests and a number of specimens were destroyed. In 1879 those that had escaped destruction were removed and arranged with the original labels in a new case, which has since been in charge of the state entomologist in his office in the capitol. A slip attached to the case states that it contains the types of fifty-four species and five subspecies described in the catalog. The Psyllidæ were all destroyed; of some of the Aphididæ portions are remaining. In the other families, the structural features remain for comparison, *but the colors have become so seriously impaired that they would be almost valueless for study.*"

During the summer of 1927 the writer was fortunate enough to be able to study the type specimens which are kept in the Albany Museum. The specimens in this collection all check according to number with the published description. However, it was very disappointing to find that, as mentioned by Lintner, some specimens had been destroyed and all the specimens were considerably faded. In fact they were so faded that superficially all the specimens appear to be yellow. Yet that they *have* faded cannot be doubted when the following facts are considered: First, the fact that Lintner mentioned that the colors of a great many of the Fitch types were so impaired as to be valueless for study. Secondly, the fact that no black was found on any of the eleven specimens which have been preserved, while in the published descriptions Fitch mentioned black in several places. Still a third reason for believing that they have faded is that the type specimens of *Clastoptera pini* Fitch, in the same collection, are yellowish forms, while *pini* characteristically is a uniform black species. Lastly certain specimens in the National Museum collection, which are supposed to be duplicates of the Albany ones still retain the black marks mentioned by Fitch in his original description.

As for the National Museum specimens they apparently cannot be taken as types. In a sense they might be ranked as paratypes. They have been preserved much better than the Albany species, in that they have not faded to the degree that the latter have. In this respect they have been of value in determining the true color of the real types, since Doctor Fitch must have had them before him when he wrote his descriptions. The labels on them, however, seem to be more or less valueless as the specimens do not check accurately with the corresponding labels on the Fitch types at Albany. This might be due to the fact that Fitch used color characteristics that are untenable, as will be discussed later under description of color.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.6 mm. to 4.2 mm. Width: ♀ 2.4 mm.

SHAPE. A pear-shaped species, of medium small size, more obovate than *hyperici* or *saint-cyri*, and yet not as elongate as some other species in the genus such as *osborni* and *salicis*.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin barely carinated. Front (tylus) anteriorly rounding and extending beyond vertex for at least two-thirds the length of the latter. Ocelli located about halfway between the anterior and posterior margins of the vertex and the

distance between the two ocelli about one-half the distance between each ocellus and eye. Length of eyes about one-fifth total width of head. Postclypeus greatly inflated, arising abruptly from sides of cheeks when viewed ventrally, length about one and three-fourths times the length of the anteclypeus, width somewhat greater than combined width of one gena and eye. Pronotum bare and shining, broadly and shallowly wrinkled with the wrinkles sometimes hardly distinguishable, and numbering from twelve to sixteen or seventeen, anterior margin rounding, posterior margin deeply emarginate and lateral margins diverging. Scutellum about two-thirds as wide as long. Elytra, length of each elytron about two and one-half times greater than width, narrow at base, then lateral margins diverging so that the widest part of body is just anterior to a line extending from apex of clavus to costal margin, from which point it abruptly incurves to rounded apex, its surface bearing relatively few hairs as compared with the other members of this group. Wing venation, cell R_5 of elytron slightly wider than long or as wide as long, cell R_3 shorter than first M_4, apical callous (bulla) round and comparatively small, occupying only approximately half of cell R_1.

External genitalia: Pygofer of female, length equal to width, exceeded by ovipositor by one-third of its length, ninth sternite about one-half length of lateral valve of ovipositor; male genital plates broad at base, inner margins rounding to a blunt apex, separated approximately three-fourths their length on median line, with styles exposed beyond genital plates about one-fourth length of latter.

Internal genitalia: Lateral valve of ovipositor roundingly pointed; dorsal valve with basal half of inner or dorsal margins united, the free apical margins bearing coarse, shallow, irregular teeth, approximately eighty in number and two notches, a smaller and almost indistinct one at point of union of the two valves, and a much deeper one at apex of middle third of valve; inner valve bladelike, narrow at base and tapering to a slender apex. Male style broad and stout, base extended into a flap and base of apical fifth bearing laterally a recurved hook, after which it tapers to a dorsad-curving, sharply pointed apex; connective roughly triangular, twice wider than long, œdagus a straight rod with rounded apex.

The writer has retained three color varieties for this group, namely *proteus, nigricollis* and *osceola.* The reasons for doing this are set forth in the following paragraphs.

Fitch in his original description makes four subspecies and thirteen varieties, based entirely on color characteristics of pronotum and scutellum. He mentions the elytra only with reference to the varieties of the subspecies *flavicollis.* Furthermore he states that there are an astonishing number of these varieties and says that those which he described in his paper are the "more prominent, though by no means all of the varieties." From this it may be inferred that Fitch had on hand a series of specimens which varied in color a good deal but which he nevertheless considered as one species. It was unfortunate that he chose color characteristics of the pronotum and scutellum only on which to base his varieties, as these appear to be too unstable for use. Moreover, he complicated things still more by being none too clear in his description of the type form. As a result subsequent writers for some reason, perhaps because of

its greater numbers, got into the habit of calling the dark form which has the yellow and black areas in sharp contrast, and which Fitch described as his subspecies No. IV, *nigricollis,* as the typical form of *proteus.* Then when a study of the types at Albany was made it was surprising to learn that the type specimen bearing the number 722, which is the first in the series of Fitch's description, has no black on the wings at all. Also, at first glance it appeared that all the other specimens were yellow forms. If this were true, it was apparent that the abundant yellow and black form so commonly taken for *proteus* would have no place among the Fitch varieties. Doctor Ball (1927) is inclined to this opinion and gives the following interpretation of the Fitch types:

"Fitch's description is incomplete as he does not mention the color of the pronotum, scutellum or elytra, and the writer inferred that he was describing the common form, with the yellow and black areas on these parts in sharp contrast, and in this all subsequent revisers have apparently concurred. Imagine, therefore, the surprise to find the type of *proteus* a pure yellow with only the narrow band on vertex and the bulla black. Fitch described *all the black* there was, and simply failed to mention the yellow parts. The writer suggested that all Fitch's subspecies belonged to the yellow group, and in that he was correct, but he did not expect to find the species itself to be the yellowest of all. Fitch's subspecies were discarded, partly because the writer did not know that the rules gave them the same status as species names, and partly because at that time the types were supposed to be lost and it was not thought possible to tell what they were, as only one color character was given. On studying the types, which are well preserved, it was found that the one color character given is all they have in *addition to that given for the species. And what was given for the species was all it had,* so the combination makes a complete description in each case.

"Fitch's subspecies all belong to the yellow group which was included under *flava,* and will hereafter be known as *proteus,* but as they, in their variations at least, represent different lesser types, they may be retained by those who wish to subdivide."

The writer, however, after studying the Fitch types at Albany, as well as the so-called Fitch types at the National Museum, together with other interesting data obtained, is unable to agree with Doctor Ball entirely in regard to these forms. In the first place Doctor Ball seems to have ignored entirely the question of fading. That this has happened seems apparent for the reasons explained in a preceding paragraph. To make this matter clearer it might be advisable to describe the type specimens in detail, at the same time comparing them with the published description. The specimens numbered 722, 723 and 724 in the Albany collection have the head, thorax and base of clavus an opaque yellow, while the rest is more or less hyaline yellow of a grayish cast. The band on clypeus and vertex is light brown and the bulla is yellow. (See paintings.) In his description Fitch speaks of "a black band on the anterior margin of the vertex in No. 722, and a broader one on front; a callous black dot on apex of elytra." He distinguishes No. 724 from the other two by the presence of an oblique, blackish vitta on the elytra. The specimen now has the vitta faded to a light brown.

Only two varieties of the second subspecies, *cinctocollis,* were preserved, No. 726 and No. 728 not being found in the collection, evidently having been destroyed. No. 725 and No. 727 are like the varieties of *flavicollis* in regard to the elytra. The yellow pigment of the head, thorax and clavus is distinct,

while the rest of the wing is a pale, greyish-tan or more or less hyaline. In his description, Fitch separates these from the other subspecies by the presence of a black band either on anterior margin or crossing the disk of the pronotum. In the type specimens the so-called black bands are a light or faint brown, sometimes barely discernible.

The third subspecies, *maculicollis*, Fitch characterized as having one or two black spots on disk. In all cases the spots were very light brownish instead of black. In No. 731 there was no indication of two black spots at all, as mentioned in the description, but rather the entire posterior half was washed in a light brown.

The last subspecies mentioned by Fitch is *nigricollis*, of which he says: "Thorax black, with a yellow band forward of the disk." He makes four varieties based on variations of the black band and color of the scutellum. The types of *nigricollis* have evidently undergone the same degree of fading as the others. Here the typical opaque yellow stands out plainly, but the rest of the elytra is a distinct tannish-brown, distinctly darker than any of the types of Fitch's other subspecies, indicating clearly a pattern derived by the fading of the black wings of the common yellow and black form, commonly termed var. *proteus* and lately called var. *flava* in Ball's last paper. No black, of course, was found on head and thorax, but was replaced by a light brown as in all the other preceding forms. The variations of the scutellum in this subspecies described by Fitch can be duplicated in our present-day collections of the common form.

It seems logical to suppose, therefore, that since the parts that were described as a deep or shining black, such as the band on the face, and the markings of the thorax, have faded to a light brown; that the brownish coloring of less intensity on the hyaline corium has also resulted from the fading of black markings on the elytra. A number of specimens on hand for study at the present time suit the description of the subspecies *cincticollis* and *maculicollis* in regard to head and thorax, but they all have the elytra washed in smoky-grey or brown. Similarly specimens of *nigricollis* show the elytra black.

In view of the above facts the writer thinks that in the large sense, *Clastoptera proteus*, Fitch would include forms varying from those which are mostly yellow to those that are almost entirely black. Furthermore that in this group there are only three color varieties that are substantial enough to be of service in classification. The color characteristics of thorax and scutellum which Fitch used are too variable to be of any use. One can find any number of variations of these characters, and they all grade into each other so slightly that it would be impossible to name them all. From a study of some four hundred specimens they seem to fall into three more or less distinct groups. Thirty-eight of these were of the all black type, thirty-eight of the yellowish or smoky forms with yellow pronota, and all the rest were the common variety where the yellow and black areas on the elytra stand out in sharp contrast. The latter has the thorax black with a yellow band cephalad of the disk, as described by Fitch under his subspecies *nigricollis*. In this series of over three hundred specimens the thorax is always of this type. Therefore it seems evident that it was the form described as *nigricollis* by Fitch and that it has very stable characteristics. Moreover, in the duplicate collection owned by the National Museum there are specimens of this common variety showing

this coloration distinctly, so that Fitch evidently had them before him when he made his original descriptions. The name *flava,* given to this form by Doctor Ball, would therefore be synonymous with Fitch's *nigricollis.* For the extreme black form the writer retains the name *osceola,* given to it by Doctor Ball (1927). It is easily distinguishable from all other *proteus* forms by its extreme blackness, so that it warrants varietal standing without a doubt. This, then, leaves the yellowish forms to be taken for the true variety *proteus.* This variety includes Fitch's subspecies *flavicollis, cincticollis* and *maculicollis,* or in other words all the forms having either an entirely yellow pronotum or bearing various slight markings of brown or black, and with the elytra yellow at base of clavus, and rest either hyaline or washed in varying shades of smoky-brown. In some cases the elytra almost border upon those of *nigricollis.* For this reason certain workers might prefer to differentiate between those having the elytra yellow or hyaline and those with the smoky or darker ones. Doctor Ball (1927) described a new variety, *Clastoptera proteus* var. *seminuda,* which is of the smoky type. Since the thorax fits the description of Fitch's subspecies *cincticollis,* and if one takes into account the fading of the original type it seems to the writer that they are the same thing. In that case, if one were desirous of making a variety of this smoky form it would have to bear the name *cincticollis.* However, since the coloring of the thorax, as well as the amount of dark on the elytra in these yellowish forms, seems to be very variable it hardly seems advisable to try to separate them too carefully. Besides it is possible that these specimens are teneral forms which were taken before they had a chance to acquire their full coloring. This has occurred in other species of Cercopidæ and it is not unlikely that it could have happened here. But since this is hard to demonstrate satisfactorily, and since Fitch evidently took all yellow specimens for his type, and his subspecies *flavicollis* at least, it will have to stand as the true *proteus.*

Clastoptera proteus var. *proteus* Fitch.

Clastoptera proteus Fitch. Fitch, Asa. Homoptera, New York State Cab. Nat. Hist., p. 53; 1851.

Clastoptera proteus var. *flavicollis* Fitch. Fitch, Asa. Homoptera, New York State Cab. Nat. Hist., p. 53; 1851.

Clastoptera proteus var. *maculicollis* Fitch. Fitch, Asa. Homoptera, New York State Cab. Nat. Hist., p. 53; 1851.

Clastoptera proteus var. *cincticollis* Fitch. Fitch, Asa. Homoptera, New York State Cab. Nat. Hist., p. 53; 1851.

Clastoptera proteus var. *seminuda* Ball. Ball, E. D. Can. Ent., vol. LIX, p. 108; 1927.

WRITER'S DESCRIPTION.

COLOR. Head yellow, vertex with an irregular black band on anterior margin, becoming wider at ocelli, eyes dark. Pronotum entirely yellow or marked in brownish-black in the form of a band on anterior margin, or one crossing the disc, or with one or two discoidal spots, or entire pronotum margined in brownish-black. Elytra, anterior two-thirds of clavus opaque bright yellow, corium at base tannish or very light brown, rest varying from pale hyaline to dark smoky, sometimes with a darker cloud across middle but never getting entirely black as in *nigricollis* and *osceola,* apical callous black. Face with a broad, shining black band across anterior half of postclypeus, and all of face

below the antennal cavities, excepting the mandibular sclerites or occasionally the genæ mottled; beak with last segment dark brown. Legs yellowish-white, with tarsus of anterior two pairs of legs washed in brown, a longitudinal dark stripe down femur and tibia, and with a dark ring around base of tibia. Hind legs yellowish, with last segment of tarsus and spines dark. Mesosternum yellow with touches of dark; metasternum and abdomen yellow mottled with dark, and in a few darker specimens almost black.

DISTRIBUTION. Doctor Ball states that "this species is common throughout the Northeastern states and eastern Canada, extending west to Montana and Northern Utah, where it is rare. The writer has not taken it in Colorado and California where much collecting has been done, rather indicating that it will not be found in the arid southwestern region outside of the higher mountains. It extends south to Florida and Texas, where it is again rare, probably owing to the hot summer. Forms from Hayti and Mexico seem to be varieties of this species."

Doctor Ball's statements refer to the species and its varieties together. The variety *proteus* is not very common as compared with the variety *nigricollis*. From the various collections in the hands of the writer only thirty-eight specimens of the former were found. The labels on these specimens showed that this variety has been taken in the following states: Iowa, Kansas, Massachusetts, Missouri, New York, South Dakota, Wisconsin and Ontario. It apparently has the same distribution as *nigricollis*. In Kansas, where the majority of the thirty-eight specimens have been taken, it was always collected along with *nigricollis*.

All of these specimens at hand for study, as well as the Fitch types in Albany, were females.

LOCATION OF TYPES. Fitch collection, New York State Museum, Albany, N. Y.

HOSTS. In Kansas it is taken on dogwood. Fitch in his description states that it was abundant on the panicled dogwood (*Cornus paniculata*). Doctor Osborn (1916) referred to it as the "dogwood spittle bug."

Clastoptera proteus var. *nigricollis* Fitch.

Clastoptera proteus var. *nigricollis* Fitch. Fitch, Asa. Homoptera, New York State Cab. Nat. Hist., p. 53; 1851.

Clastoptera proteé Fitch. (*Clastoptera saint-cyri*). Prov. Petite Faune du Entomologique, p. 253; 1885.

Clastoptera proteus var. *proteus* Fitch. Van Duzee, E. P. Cat. of Hemiptera, p. 519; 1917.

Clastoptera proteus Fitch. McAtee, W. L. Cercopidæ of the Vicinity of Washington, D. C., Proc. Ent. Soc. Wash., vol. 33, p. 174; 1920.

Clastoptera proteus var. *candens* McAtee. Cercopidæ of the Vicinity of Washington, D. C., Proc. Ent. Soc. Wash., vol. 33, p. 175; 1920.

Clastoptera proteus var. *saint-cyri* Prov. Stearns, L. A. Hemiptera Conn., p. 234; 1923.

Clastoptera proteus var. *flava* Ball. Ball, E. D. Can. Ent. LIX, p. 108; 1927.

WRITER'S DESCRIPTION.

COLOR. A black, yellow and brownish variety. Front yellow, vertex bright yellow with a broad black band on anterior margin, reaching ocelli. Eyes brown or grayish-brown. Pronotum shining black with a bright yellow band on anterior portion. Scutellum usually entirely black, sometimes with a yellow

spot at base, occasionally the entire scutellum yellow, margined with black. Elytra, anterior three-fourths of clavus opaque yellow, rest dark brown, fading to brownish-hyaline at apex, corium with a median dark brown or blackish cloud, rest brownish-hyaline except the black apical callous, which is margined in yellow and a clear hyaline area anterior to and surrounding the apical callous.

NOTES ON SYNONYMY.

McAtee (1920) established a variety of this form which he called *Clastoptera proteus* var. *candens*. The following is the original description of the variety:

"Like var. *proteus*, except that anterior two-thirds of clavus, scutellum, bands on pronotum and vertex and face are orange-red, instead of yellow, and other pale markings are ruddy-tinged. Length 3.25 to 4 mm. Type, a female. Mt. Vernon, Va., June 27, 1915, on *Cornus*. W. L. McAtee. Two paratypes, same data."

To the writer this does not seem to be a good variety. As McAtee himself says, certain climatic conditions may effect the yellow pigment of this species. He gives the following discussion:

"The high color of these specimens is not due to the influence of cyanide in the killing bottle, such as is sometimes observed in specimens of bees in the genus *Nomada* and certain other insects, but was noted at the time of collection. Certain animal pigments seem to be quite unstable, and the yellow of *Clastoptera proteus* may be another instance. Crawfishes turn red after cooking, digestion in a bird's stomach, or weathering after death; and one of the species of southern range (*Cambarus clarkii*) is bright red in life. Some of the Eumenidæ having yellow marks in the north are red-patterned in the south. It would appear, therefore, that climatic factors affect certain pigments of living animals in the same way that chemical processes are known to affect them in the dead. The present newly described variety of *C. proteus* may be an example of such effect."

Doctor Ball states that this variety has been taken only from Virginia. Specimens from New Jersey are in the American Museum collection. Also one specimen has been taken from Michigan and one from Kansas. The first of these is orange on one elytron only. This would lead one to infer that this coloring is not constant enough to establish a new variety. Besides, the writer has found three specimens of *Clastoptera salicis* where the yellow has turned orange, and several other specimens where the legs and parts of body are tinged with orange, particularly on the under side of body.

DISTRIBUTION. The variety *nigricollis* seems to have a very wide distribution, as mentioned by Doctor Ball under his discussion of the species. The writer had on hand for study specimens from the following states: California, Ontario, Colorado, Connecticut, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, Ohio, Pennsylvania, South Dakota and Wisconsin. It has been reported from the following additional states: Florida, Maine, Montana, New Hampshire, North Carolina, Texas, Utah and West Virginia.

The proportion of males and females is approximately equal, with perhaps a few more females than males.

LOCATION OF TYPES. Fitch collection, Albany State Museum, Albany, N. Y.

HOSTS. This, like the variety *proteus*, has been taken on dogwood. Specimens in the National Museum collection have been taken from the Arnold arboretum, Boston, Mass., and were swept from *Vaccinum* spp., *Cornus albus*

rosenthalii, Cornus racemosus, and *Cornus amœmum.* Van Duzee reported it from blueberry.

Clastoptera proteus var. *osceola* Ball.

Ball, E. D. Can. Ent., vol. 58, p. 108; 1927.

ORIGINAL DESCRIPTION.

All black above, except the three anterior yellow bands, a spot on scutellum, a yellow area at the base of elytron, and a light area before the bulla. In the darkest examples only the two anterior yellow bands remain.

Holotype female, Toronto, August 8, 1924; allotype male, Kingston, August 5, 1924; and three pairs of paratypes from the same localities and Osceola, Wis., all collected by the author.

WRITER'S DESCRIPTION.

COLOR. Mostly a black form with yellow and brownish markings. Front yellow, vertex with a broad black band on anterior margin, reaching ocelli. Eyes brown. Pronotum shining black, except for a bright yellow band across anterior portion. Scutellum all black. Elytra, usually with anterior three-fourths of clavus and a broad median cloud black or dark blackish-brown, sometimes a faint indication of yellow at base of clavus, rest of elytron brownish-hyaline, excepting for the costal cell between apical callous and black area which is clear hyaline. Apical callous black, margined anteriorly with yellow. Face with a broad, shining black band across anterior half of postclypeus, and all of face below the antennal cavities black excepting the mandibular sclerites, or occasionally the genæ mottled. Legs yellowish-white, with tarsus of anterior two pairs of legs washed in brown, a longitudinal dark stripe down femur and tibia and with a dark ring around base of tibia. Hind legs yellowish with last segment of tarsus and spines dark. Mesosternum brown. Metasternum yellow and abdomen usually black.

COMPARATIVE NOTES. This variety differs from the var. *nigricollis* in that it has at most but a faint suggestion of yellow at base of clavus, and usually none. It more nearly resembles *C. saint-syri* var. *anceps* than it does var. *nigricollis,* since the former is likewise an almost entirely black form. It can be distinguished readily enough from the variety *anceps,* however, both by color and structure. The latter bears no yellow markings at all on its dorsal surface, while *osceola* has two or three anterior yellow bands on vertex and pronotum. Structurally the two species differ in the following respects: In *anceps* the female specimens, at least, have the front much more inflated, the front more strongly produced anteriorly beyond vertex and head, and anterior part of prothorax held more vertically than in *osceola.* Moreover, *anceps* is a shorter, stouter species than *osceola.* In *osceola* the black band on the face is only one-half the length of the postclypeus, while in *anceps* it is always two-thirds of the length. The ovipositors differ in the following respects: In *anceps* the ninth sternite is longer proportionately to the lateral valve, and the lateral valves do not extend beyond the pygofer nearly as much as in *osceola;* while the dorsal valve is much broader and shorter, the notches are more pronounced and the teeth are more numerous, regular and deeper in the former than in the latter. The base of the ventral valve is expanded in *anceps,* but decidedly narrowed in *osceola.*

Clastoptera proteus var. *osceola* might easily be confused with *Clastoptera hyperici,* which is also a black form. It differs from this species in the following ways: *Hyperici* has an ovate body, tapering at both ends equally, and is widest directly through the middle, while *osceola* is widest caudad of the middle from whence it abruptly tapers to apex, thus making the body rather pear-shaped. The easiest recognizable difference, however, is the color of the elytra; *osceola* has the apical portion all brownish-hyaline with a clear hyaline spot surrounding the apical callous, while *hyperici* is almost a solid black or very dark brown, with the exception perhaps of the membrane, which is only a trifle lighter and clearer than the rest of the elytron. The ocelli of *osceola* are located closer together than in *hyperici,* the distance between the ocelli in *osceola* equaling about one-half the distance between each ocellus and eye, while in *hyperici* the space between the ocelli is about three-fourths the latter distance. The front (tylus) in *hyperici* extends cephalad much farther than in *osceola,* usually as much as length of vertex, while in the latter it protrudes only about one-half the width of vertex. The clypeus of *hyperici* is likewise much more inflated than that of *osceola.* Another outstanding difference is that the elytra of *hyperici* are covered by twice as many hairs as in *osceola* or *anceps* and the hairs are of a much finer and longer texture. In *hyperici* the lateral valve of the ovipositor is shorter and decidedly more bluntly rounded, the ninth sternite is about two-thirds the length of the valve instead of being one-half as in the latter, and the inner valve is much wider and shorter. Also, this inner valve in *hyperici* entirely lacks the second prominent notch found on the inner margin of the valve, and the basal notch is not nearly as prominent as in *osceola.* The teeth of this valve in *hyperici* are very fine and regular, numbering approximately 110, while in *osceola* they are more irregular and number around 80. The middle valve of *osceola* is narrowed considerably at base, which condition is not found in *hyperici.* The male genitalia of *hyperici* has the lateral hook much longer in proportion to apical hook than in *osceola.* For comparison with *xanthocephala* see discussion under the description of *xanthocephala* on page 76.

DISTRIBUTION. The variety *osceola* seems to have a more limited distribution than *nigricollis.* The type locality, according to Doctor Ball, is Canada and Wisconsin. In the Snow collection at the University of Kansas there are some thirty-eight specimens all taken from Michigan and Wisconsin. In other collections a few specimens are labeled from New York, New Jersey and Massachusetts. Therefore this variety seems to be limited in its distribution to the Northeast.

LOCATION OF TYPES. Collection of Dr. E. D. Ball, Sanford, Fla.

HOSTS. This variety has been taken along with the variety *nigricollis,* so its chief host plant is dogwood. One specimen in the National Museum collection bears a label stating that it has been taken from the Arnold arboretum, Boston, Mass., on *Vaccinum* sp.

Clastoptera saint-cyri Provancher.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera saint-cyri Prov. Provancher. Nat. Can. IV, p. 351; 1872.

ORIGINAL DESCRIPTION.

Clastoptera saint-cyri nov. spec.—Longeur, 18 poucé. Varié de jaune et de noir. Tête noire avec 2 bandes transversales jaunes, l'une aur le vertex et l'autre rapprochée du bord antérieur. Rostre et bas des joues jaunes: thorax noir, avec une bande transversale jáune près du bord antérieur. Elytres avec 2 bandes jaunes partant de l'épaule et se dirigeant obliquement vers la suture, sans se rencontrer; leur sommet brunâtre, assez transparent, avec un point noir brillant vers l'extremité. Dessous noir; pattes jaunes.

Trés common. Trés rapproché du *Cl. pini* de Fitch par sa taille et sa forme, mais en différant grandement par sa coloration.

Thus Provancher described this species in 1872 as a new species. Then in a second paper, published in 1885, he wrote a description of Fitch's *proteus* wherein he mentions the clavus being yellow at base and darker at apex, and accompanies his description with an illustration. There is no doubt but the form he had in mind was *C. proteus* var. *nigricollis* of Fitch. In this latter paper he states that his species *saint-cyri* is a synonym of Fitch's *proteus* and makes it a variety of *proteus* instead.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.45 mm. to 3.9 mm. Width: ♀ 2.25 mm. to 2.62 mm.

SHAPE. A short, broad species, apparently the most globose and inflated of the *Clastoptera* series, with head and thorax more vertical when viewed from the side than in other species.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin not distinctly carinated. Front (tylus) usually produced cephalad as much as the length of the vertex. Eyes with length about one-fifth of total width of head. Ocelli located halfway between anterior and posterior margins of vertex with the space between them a little over one-half the distance between each ocellus and eye. Postclypeus very strongly inflated, length about one and three-fourths times length of anteclypeus, width somewhat wider than combined width of gena and eye. Pronotum bare and shining, broadly and shallowly wrinkled, with wrinkles sometimes barely distinguishable, numbering about 16 or 17, anterior margin rounding, posterior margin deeply emarginate and lateral margins diverging; head and anterior part of prothorax when viewed from side more vertical. Elytra, length of one about two and one-fourth times its width, narrow at base, then lateral margins diverging so that widest part of body is just cephalad of a line drawn from apex of clavus to costal margin, from which point they abruptly round to apex; their surface covered by relatively few hairs, slightly more than in *proteus* but fewer than in *hyperici* or *salicis*. Wing venation, cell R_5 of elytron slightly wider than long or almost equal, cell R_3 shorter than first M_4, darkened portion of apical callous round and comparatively small, not reaching costal margin, but with rest of cell R_1 sometimes thickened.

External genitalia: Pygofer trifle wider than long, exceeded by ovipositor

one-fifth of its length, ninth sternite almost two-thirds length of valve. Male genital plates broad at base, inner margins separated approximately three-fourths of their length and rounding to a blunt apex, styles exposed about one-fourth length of plates.

Internal genitalia: Lateral valve of ovipositor roundingly pointed, decidedly shorter and broader than in *proteus;* inner valve with basal part of inner margins united and free apical portions bearing fine, deeply notched teeth, numbering around 108, and with two well-pronounced notches, one located at point of union of the two valves and the other at base of apical third; inner valve bladelike, not much narrower at base and tapering to a pointed apex. Styles of male broad and stout, base extended into a flap, apical fifth at base bearing laterally a recurved hook, from whence it tapers to a long dorsad-curving, sharply pointed apex; connective, roughly triangular, twice wider than long, œdagus a straight rod with a rounded apex, which is always more or less curved dorsad.

Clastoptera saint-cyri var. *saint-cyri* Provancher.

Clastoptera saint-cyri Prov. Provancher. Nat. Can. IV, p. 351; 1872.
Clastoptera proteus var. *vittata* Ball. Ball, E. D. Proc. Ia. Acad. Sci. III, p. 187; 1895.
Clastoptera proteus var. *vittata* Ball. Van Duzee, E. P. Catalogue of Hemip.; 1917.
Clastoptera proteus var. *vittata* Ball. Stearns, L. A. Hemip. Conn., p. 234; 1923.
Clastoptera proteus var. *saint-cyri* Prov. Ball, E. D. Can. Ent. LIX, p. 107; 1927.

WRITER'S DESCRIPTION.

COLOR. Dark brown or black, marked with yellow. Vertex with anterior black border, reaching ocelli, the rest yellow. Pronotum black with black anterior margin followed by a yellow band of varying width, extending to base of eyes or sometimes a second broad yellow band caudad to first one, which may be reduced to a spot or enlarged so as to occupy the posterior part of pronotum in varying degrees. Scutellum usually black with a yellow spot on apex, or occasionally all black. Elytra blackish-brown and yellow, clavus appearing striped, due to two yellow diverging bands which start together at base, the inner extending three-fourths the length of the clavus, leaving a narrow black border along the elytral margin, and the outer extending along the claval suture, often posteriorly divided by a black line, the apex of clavus brownish-hyaline, corium dark brown with the explanate costal margin brownish-hyaline, a jagged oblique yellow band across middle, and the apical third brownish-hyaline with the exception of the costal cell anterior to the apical callous which is hyaline, and the apical callous itself which is black surrounded by yellow. Face with a a shining black band extending caudad for three-fifths the length of the postclypeus, and dorsad on front for at least half its length, making the yellow band at base of front which is viewed from above only half as wide as in the other members of this *proteus* group, the anterior margin of black band almost straight across to the posterior corners of the mandibular sclerites instead of being strongly convex between these points as in *proteus;* genæ all black excepting the mandibular sclerites; anteclypeus yellow with a dark spot in center. Legs pale yellow, excepting a longitudinal streak on anterior two pairs of femora, and tibiæ and tarsi black. Hind legs entirely yellow, with the exception of the last tarsal segments and spines on

tibiæ and tarsi, which are dark brown or black. Mesosternum dark brown. Metasternum yellow. Abdomen brown or black.

COMPARATIVE NOTES. See notes under this heading in the description of *Clastoptera salicis.*

DISTRIBUTION. A large series has been taken in Michigan. Provancher says it is very common in Canada. Other states in which it has been taken are Connecticut, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania and Wisconsin.

One hundred and thirty-two specimens were available for study, all of which were females.

HOSTS. Doctor Hungerford states that this variety has been taken in Michigan, sweeping the same low vegetation on which *anceps* is taken. In the National Museum collection are specimens from Boston, Mass., which bear the same data on their labels as some specimens of *Clastoptera proteus* var. *osceola* and var. *nigricollis.* One specimen was taken from *Vaccinum* sp., one from shrub collection, one from *Leucothee* sp. and one swept from *Gyluscacia* sp. Another set of eight was labeled "Reared from Cranberry." Six of these were striped *saint-cyri* females and two were black males of the typical *anceps* type. These eight are mounted on two cards, on one four females and on the other two females and two black males.

Clastoptera saint-cyri var. *anceps* McAtee.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera proteus var. *anceps* McAtee. McAtee, W. L. Cercopidæ of the Vicinity of Washington, D. C., with Descriptions of New Varieties of *Clastoptera.* Proc. Bio. Soc. of Wash. 33, p. 174; 1920.

Clastoptera proteus subsp. *nigra* var. *b.* Ball. Ball, E. D. Proc. Ia. Acad. Sci. III, p. 187; 1895.

Clastoptera proteus var. *pini* Fitch. Stearns, L. A. Hemiptera of Conn.; 1923.

Clastoptera proteus var. *anceps* McAtee. Ball, E. D. Can. Ent. LIX, p. 109; 1927.

According to McAtee and Van Duzee the name *nigra* is preoccupied by *Clastoptera nigra* Germar. Therefore Doctor Ball's original varietal name cannot stand. This species is not synonymous in the least with *Clastoptera pini,* as Van Duzee and Stearns both thought. A new name was therefore necessary, which was supplied by McAtee (1920). McAtee, however, placed it as a variety of *proteus.* Structurally it differs from *proteus,* but resembles *saint-cyri,* so that it must be placed as a variety of the latter.

Ball (1927) lists his variety *nigra* as being synonymous with *hyperici.* According to his original description (1895) it seems evident that his var. *a* was the same as *C. proteus* var. *osceola* because of the yellow band on vertex, while his variety *b* probably referred to *anceps.* Specimens which he sent to the writer for study labeled *nigra* were typical forms of the variety *anceps.*

ORIGINAL DESCRIPTION.

Black above, tegmina posterior of apical callous yellowish-hyaline, explanate margin anterior of middle of costa sometimes same color; costal margin just anterior of apical callous clear hyaline; black below, except lower part of face, clypeus, beak, most of pectus, and legs which are pale yellow, with the fol-

lowing parts dark; an elliptical spot on clypeus, tip of beak, lengthwise streaks on anterior two pairs of femora, and tibiæ and tarsi except the hind ones, of which the spines and terminal joints are dark. Length 2.75 to 3.25 mm. Type, a male; Beltsville, Md., June 14, 1914, W. L. McAtee. Paratypes, with same data, also same locality, July 4, 1915, W. L. McAtee; and Cranberry Lake, N. Y., August 5, 1917, C. J. Drake.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.75 mm. to 4.05 mm.; ♂ 2.75 mm. to 3.6 mm. Width: ♀ 2.55 mm. to 2.85 mm.; ♂ 1.8 mm. to 2.25 mm.

COLOR. All black and brown above, front and vertex shining dark brown or all black. Eyes light to dark brown. Pronotum shining black. Scutellum all black. Elytra with anterior three-fourths of clavus and a median large spot across corium pitch black, rest of wing brownish-hyaline except for the costal cell between apical callous and the black spot, which is clear hyaline. Apical callous black margined anteriorly with yellow. Face, postclypeus with a shining black band on anterior three-fifths or two-thirds, rest of face black excepting mandibular sclerites and anteclypeus, the latter with a central black spot, labium dark at tip. First two pairs of legs yellow except for a longitudinal brown stripe on femur and tibia, the latter with a dark spot running into the longitudinal stripe, the tarsus entirely brown. Hind legs all yellow, excepting last tarsal segment and spines which are dark brown or black. Mesosternum, excepting median portion and abdomen, black.

COMPARATIVE NOTES. *C. proteus* var. *anceps* may be easily mistaken for any of the other dark species found in the genus. For comparison with *C. proteus* var. *osceola,* which it closely resembles, see discussion on page 43.

Likewise it resembles *C. hyperici* very closely, but can readily be distinguished by the following characteristics: The body of *hyperici* is more oval in shape than *anceps* is, tapering at both ends equally and widest directly through middle of body, while in *anceps* the body is widest posterior to middle or just anterior to a line running from tip of clavus to costal margin. Also *anceps* is proportionately broader than *hyperici.* The easiest recognizable difference, however, is the color of the elytra; *anceps* has the apical portion all brownish-hyaline with a clear hyaline spot anterior to apical callous, while *hyperici* is almost a solid black or very dark brown, with the exception, perhaps, of the membrane, which is only a trifle lighter and clearer. The ocelli are located closer together than in *hyperici,* the distance between the ocelli in *anceps* equaling about one-half the distance between each ocellus and eye while in *hyperici* the space between the ocelli is about three-fourths the latter distance. Another outstanding difference is that the elytra of *hyperici* bear about twice as many hairs as do those of *anceps* and are longer and of a much finer texture. The lateral valve of the oviposter of *hyperici* is much shorter and decidedly more bluntly rounded than the other. The dorsal valve is shorter and therefore wider in *hyperici,* and only bears a faint indication of one notch at point of union of inner margins of the valves, while *anceps* bears two very distinct notches. The teeth of this valve are equal in number, namely, about 110, with those of *anceps,* but since the valve is much shorter and smaller they appear to be more numerous, and in actual width are about

half the size of the teeth in *anceps*. The male genitalia are very similar, the chief difference being that the base of the apical hook in *anceps* seems to be somewhat more slender than that of *hyperici*.

For the comparison with *C. binotata* and *C. sierra*, see the discussion on page 31, and for comparison with the males of *C. brunnea*, *C. lineatocollis*, see the discussion on page 23. For comparison with *xanthocephala*, see the discussion in the description of the latter, on page 76.

DISTRIBUTION. Specimens have been taken from Maine, Maryland, Massachusetts, Michigan, Montreal, New Jersey, New Hampshire, New York, Rhode Island, Washington, D. C., and Wisconsin. A large series was obtained by Dr. H. B. Hungerford, Mr. Charles Martin and Mr. Edward Becten from Douglas Lake, Mich.

Approximately 188 specimens were examined. Of this number only 63 were females and 112 were males.

LOCATION OF TYPES. In the collection of the National Museum, Washington, D. C.

HOST PLANTS. Doctor Hungerford took this species in Michigan when sweeping low vegetation. It was taken along with *saint-cyri*. In distribution they appear to be about equal in number to the latter, although *anceps*, perhaps, is a trifle more abundant than *saint-cyri*. *Anceps* has also been taken, according to labels, at Boston, Mass., in the Arnold arboretum, apparently along with *saint-cyri*, *nigricollis* and *osceola* on *Vaccinum* sp. Specimens of this variety have also been taken at Mount Desert, Me., along with *saint-cyri*.

Clastoptera salicis Doering.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera salicis Doering. Doering, K. C. Ann. Ent. Soc. Am. 19, p. 85; 1926.
Clastoptera proteus var. *salicis* Doering. Ball, E. D. Can. Ent. LIX, p. 107; 1927.

ORIGINAL DESCRIPTION.

SIZE. Length: ♀ 4.4 mm. to 5.2 mm.; ♂ 4 mm. Width: ♀ 2.4 mm. to 2.8 mm.; ♂ 2.4 mm.

SHAPE. An elongate, slender form, in size equaling some of the larger forms in the genus.

COLOR. Dark brown or black, and conspicuously marked with yellow. Vertex with anterior black border, reaching ocelli, the rest yellow. Face, anterior third or two-fifths of postclypeus and all of genæ black the rest of the face yellow, labium dark at tip. Pronotum black, with black anterior margin followed by a yellow band which extends to the bases of the eyes, and with a second yellow band on posterior half, which may be reduced to just a spot or be entirely lacking. Scutellum, usually entirely black or brownish-black, but frequently with apex light yellow or occasionally a light longitudinal band extending along median line, which sometimes broadens just in front of middle into two light spots. Elytra blackish-brown and yellow, clavus appearing striped, due to two yellow bands which start together at base, the one extending one-half to almost two-thirds the length of the clavus, leaving a narrow black border along the elytra margin, and the other extending along the claval suture almost to the tip; corium dark brown, spotted with yellow

as follows: A small longitudinal spot at base of costal margin; a large rounded or rectangular one about midway on costal margin, and just caudad of this but near the claval suture a longer, somewhat trapezoidal or triangular one; apical callous surrounded by yellow with a large spot cephalad, tapering to a point anteriorly, usually a line near costal margin, extending near apical callous to a large brown spot near middle of costa, the cell between apical callous and this spot being hyaline, and another small, hyaline area, usually showing in the yellow spot, cephalad of apical callous. Coxa, trochanter, and femur of first two pairs of legs yellow, washed in orange or light brown, tibia and tarsi black, with sometimes a yellow band or mark at base of tibia. Hind legs entirely yellow, with the exception of the last two tarsal segments and spines on tibiæ and tarsi, which are black or dark brown. Mesosternum brown or black; metasternum yellow. Abdomen brown or black, sometimes posterior margins of segments lighter.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin not distinctly carinated. Each eye slightly over one-fifth width of head. Ocelli located slightly nearer anterior margin of vertex than pronotum, and distance between the two ocelli about three-fourths the distance between each ocellus and eye. Postclypeus not as strongly inflated as *proteus* or *saint-cyri,* indistinguishably fused with front, which is prolonged anteriorly beyond vertex for about two-thirds length of latter, being somewhat longer in the female than in the male; postclypeus much longer proportionately than anteclypeus, at least twice, labium reaching to trochanter of middle pair of legs, postclypeus wider than gena and eye. Pronotum finely wrinkled, wrinkles numbering at least twenty-one or twenty-two, posteriorly more broken and numerous and somewhat deeper, cephalic margin produced and a trifle more angulate, posterior margin deeply emarginate, about half width of anterior margin, lateral margins slightly sinuate. Elytra approximately two and three-fourths times as long as wide, base of costal margin flaring, then parallel-margined to apical third of elytron, from whence it abruptly incurves to rounded apex, with no point along costal margin wider than any other and with elytra only slightly inflated, covered thickly by long, fine hairs. Wing venation, cell R_5 much longer than wide, cell R_3 shorter than cell first M_4, apical callous large, oval or elongate, taking up most of cell R_1.

External genitalia: Pygofer, length equal to width, exceeded by ovipositor about one-fourth its length, the ninth sternite longer than one-half length of lateral valve; male genital plates broad at base, inner margins rounding to a blunt apex, exceeded by genital styles only slightly.

Internal genitalia: Lateral valve tapering to a very pointed apex, inner valve united on inner margins for half their length, their free apical inner margins slightly and irregularly jagged, bearing two notches, one at point of union of the two valves and the other at base of apical fourth; middle valve, with base expanded, then slightly narrowed, from whence it broadens slightly and then tapers to a pointed apex. Male styles broad and stout, base extended into a flap, apical fourth at base bearing laterally a recurved hook, from whence it tapers to a slender dorsad-curving sharply-pointed apex; connective roughly triangular, twice wider than long, œdagus a straight rod with a rounded apex.

COMPARATIVE NOTES. *Clastoptera salicis* can easily be told from any other

member of the *proteus* group by its coloration and large size, being at least one-fourth longer than the others. In color pattern the only one that possibly might be confused with it is *Clastoptera saint-cyri* var. *saint-cyri,* since both of these forms have the clavus of the wings striped with black and yellow. However, size alone would distinguish these two, as well as the following structural differences: Front of *salicis* only extends anteriorly about two-thirds length of vertex, while in *saint-cyri* the lengths are equal. The face of *salicis* is considerably less inflated and the length of the postclypeus is much longer proportionately than that of *saint-cyri,* being in the former twice the length of the anteclypeus, while in the latter not over one and three-fourths the length of anteclypeus. The wrinkles on the pronotum are more numerous and deeper than in *saint-cyri.* The elytra are scarcely inflated and the margins are parallel, which is distinctly different from *saint-cyri,* where the elytra are greatly inflated, and the margins diverge so that the wide part of the body is just anterior to a line across to apex of clavus. *Salicis,* in this characteristic, is between *Clastoptera xanthocephala* and *Clastoptera hyperici,* and therefore does not resemble the *proteus* group at all. The wing venation is perhaps the best character for distinguishing *salicis* from any of the *proteus* group; cell R_5 is much longer than wide in this species, while in all the others it is just the opposite, being usually wider than long, or equal in width and length. Also the apical callous in *salicis* is much larger, occupying much more of cell R_1 than it does in *saint-cyri.* The hairs on the elytra are about twice the number they are on *saint-cyri* and the *proteus* group. *Salicis* resembles *hyperici* in this respect. The ovipositor extends one-fourth of its length beyond pygofer while in *saint-cyri* it extends about one-fifth of its length. Still another difference has to do with the inner margins of the inner valves of the ovipositor, which are irregularly jagged but not distinctly toothed in *salicis,* but which bear regular, distinct teeth in *saint-cyri,* numbering about one hundred and eight. Moreover, although the coloration of the face in this form seems to be that of the *proteus* group, namely, the black band on anterior part of face with lower part of postclypeus, anteclypeus and mandibular sclerites yellow in sharp contrast, yet this yellow band in *salicis* is characteristically less than in the other members of the *proteus* group, and particularly *saint-cyri.* In *salicis* the band is typically two-fifths or one-third of the length of the postclypeus, while in *saint-cyri* it is always over one-half, usually nearer three-fifths. Occasionally a few specimens of *salicis* show the band almost one-half the length of the postclypeus, but upon examination of sixty specimens the majority were found to have a band which was less than one-half. Besides in *saint-cyri* and the var. *anceps* the black band extends dorsad on the front, but does not do this in *salicis* or *proteus.*

Doctor Ball places *salicis* as a variety of *proteus,* for which the writer sees no justification at all. Outwardly there is no resemblance, the larger size and color pattern of *salicis* distinguishing it immediately. The only reasons for confusing it with any of the *proteus* group are because of the color of the face and the similarity of the male genitalia. The color of the face, although one of the causes for placing *salicis* with *proteus* and its varieties, at the same time proves to be a good characteristic for distinguishing *salicis* from the other members of the group. As was mentioned before, the anterior black band on the face in *salicis* is usually not as wide as the bands in the other members of this

group. In *saint-cyri* this band is three-fifths of the postclypeus, in *anceps* and *hyperici* two-thirds, and in *proteus* always one-half.

Structurally *salicis* differs from *proteus* in a number of ways. The face of *salicis* is less inflated than that of *proteus* (figs. 5 and 6, pl. III). The wrinkles on the pronotum are more numerous and slightly deeper. The elytra are scarcely inflated in *salicis*, while in *proteus* they are considerably inflated, and their margins are parallel in the former but diverge in the latter. The pubescence on the elytra of *salicis* is about twice as heavy as on *proteus*. The outstanding characteristic is that cell R_5 of *salicis* is considerably longer than wide, but in *proteus* it is slightly wider than long. The apical callous of *salicis* is much larger and more ovate, occupying most of cell R_1, while in *proteus* it is round and small. The ovipositor extends beyond the pygofer about one-fourth of its length instead of one-third as in *proteus*. Then, too, the ninth sternite is longer than one-half the length of the lateral valve, while in *proteus* it is about one-half. The inner margins of the inner valves of the ovipositor bear two distinct notches as in *saint-cyri*, while in *proteus* the first notch is lacking or only faintly indicated. Moreover, these margins in *salicis* are irregularly jagged but not cut deep enough to form distinct teeth, while in *proteus* they bear distinct teeth. The male genitalia are twice the size of either *saint-cyri* or *proteus*, a fact which alone would distinguish this species from the latter two. The apical hook on the genitalia seems more slender than that of *proteus*, and the lateral hook is much longer in proportion to the apical hook, while the style itself is not as broad proportionally as in *proteus*.

DISTRIBUTION. A series of some seventy specimens have been collected from four counties in Kansas and one other specimen from Missouri. In this series only three were males, which shows that the males are exceedingly rare.

LOCATION OF TYPES. Holotype and allotype are located in the Snow collection, University of Kansas.

HOST PLANTS. This species has been taken on two species of willow, *Salix amygdaloides* Anders., the broad-leaved willow, and *Salix longifolia* Muhl., the narrow-leaved willow, both of which border rivers.

Clastoptera hyperici Gibson.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera proteus var. *hyperici* Gib. McAtee, W. L. Proc. Bio. Soc. Wash., vol. 33, p. 174; 1920.

Clastoptera proteus var. *hyperici* McAtee (Gib.) Ball, E. D. Can. Ent. LIX, p. 109; 1927.

ORIGINAL DESCRIPTION.

Agreeing with *proteus* var. *proteus* in inflation of face, shape of vertex, striæ of pronotum and genitalia, but entirely black above and below, also with the exceptions of the lower part of the face, clypeus, most of pectus, posterior two pairs of coxæ, two spots, or an interrupted stripe on lower surface of each of the anterior two pairs of tibiæ, a spot on anterior surface near apex of each femur sometimes excepted, apices of hind tibiæ except spurs, and hind tarsi except spurs and last joint, pale yellow. Length, 2.5 to 3.5 mm. Type, a male, Plummers Is. Md., July 5, 1914, on *Hypericum prolificum*, W. L. McAtee, al-

lotype same data. Paratypes, same data, also same data except as to dates, July 14 and 26, 1914, and same locality August 11, 1907, W. L. McAtee.

This variety has been seen also at Great Falls and at Occoquan, Va., in each case upon the same food plant, being most abundant during the flowering season.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.5 mm.; ♂ 3.15 mm. Width: ♀ 2.25 mm.; ♂ 2.1 mm.

SHAPE. An ovate, small species, tapering posteriorly and anteriorly almost equally with the greatest width of body directly across middle.

COLOR. Almost uniformly black above with the exception of the apical portion of corium and membrane which is slightly lighter in color. Postclypeus with a black band across anterior two-thirds, rest of face black, excepting mandibular sclerites and anteclypeus, which are yellow, the latter with a dark spot at center. Labium dark. First two pairs of legs with coxa mottled in yellow and brown, femur black but usually with a yellow spot on anterior surface near apex, tibia black excepting two yellow spots or interrupted stripe on lower surface. Hind legs black with apices of tibia, and first two segments of tarsus light. Mesosternum black; metasternum either all yellow or black with the median portion light. Abdomen entirely black.

STRUCTURAL CHARACTERISTICS. Vertex slightly depressed transversely, anterior margin not distinctly carinated. Front prolonged anteriorly as much as the length of the vertex. Greatest length of eye about equal to one-fifth total width of head. Ocelli, located halfway between anterior and posterior margins of vertex, with the space between them almost three-fourths the distance between each ocellus and eye. Postclypeus very strongly inflated, length about one and three-fourths times length of anteclypeus, width somewhat wider than combined width of gena and eye. Pronotum bare and shining, broadly and shallowly wrinkled, with anterior wrinkles sometimes indistinguishable and numbering about seventeen or twenty, anterior margin rounding, posterior margin deeply emarginate and lateral margins diverging. Elytra, length of one, about twice width, narrowed at base, then margins evenly sinuate to apex, so that body is widest across the middle; surface covered by many long, fine hairs. Wing venation, cell R_5 of forewing wider than long, apical callous not distinct, being same color as rest of elytron, only slightly raised, occupying nearly all of cell R_1.

External genitalia: Pygofer of female, length about equal to width, exceeded by ovipositor by over one-third its length, ninth sternite two-thirds length of lateral valve. Male genital plates broad at base, inner margins separated for part of their length, rounding to a blunt apex, the styles exposed only slightly beyond valves.

Internal genitalia: Lateral valve of ovipositor bluntly rounded at apex; inner valve with basal part of inner margins united, and free apical portions bearing fine teeth, numbering around 110, and a small notch at point of union of the two valves; inner valve bladelike, not narrowed at base and tapering to a pointed apex. Styles of the male broad and stout, base extended into a flap, and base of apical fifth, bearing laterally a recurved hook, after which it tapers to a long dorsad-curving, sharply pointed apex; connective roughly tri-

angular, twice wider than long, œdagus a straight rod with rounded apex which is curved dorsad.

COMPARATIVE NOTES. This species, being an entirely or almost entirely black form, is apt to be confused with the other black forms in the genus. For comparison with *C. binotata,* see page 32, with *sierra,* see page 34, with the males of *brunnea* and *lineatocollis,* page 23, and with *xanthocephala,* page 76. In the *proteus* group it very closely resembles *C. proteus* var. *osceola* and *C. saint-cyri* var. *anceps.* For comparison with these forms see pages 44 and 48.

DISTRIBUTION. Only five specimens were available for study. These were sent to the writer for study by Mr. McAtee and were all collected from Plummer's Island, Md.

LOCATION OF TYPES. The types are in the collection of W. L. McAtee, Washington, D. C.

HOST PLANTS. Taken on *Hypericum prolificum* (St. John's Wort).

Clastoptera distincta sp. new.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

SIZE. Length: ♀ 4.65 mm. to 5.02 mm.; ♂ 4.35 mm. to 4.5 mm. Width: ♀ 2.62 mm. to 2.7 mm.; ♂ 2.4 mm. to 2.47 mm.

SHAPE. An elongate species with a pointed head and body decidedly tapering to a slender apex posteriorly, resembling *osborni* in shape more than any other species.

COLOR. A striking chocolate-brown and yellowish-green species. Front and vertex greenish-yellow, the lateral margins of both shaded in brown and with three pairs of brownish arcs visible from above on front. Face, postclypeus yellow with nine or ten pairs of distinct brown arcs, the posterior three or four pairs usually more or less fused together to form an irregular dark band, lower two-fifths of postclypeus, all of anteclypeus excepting a median dark spot and mandibular sclerites all yellow, the latter sometimes washed through center with fuscous; genæ dark brown with margins, and especially anterior portions, much lighter. Pronotum entirely greenish-yellow, with lateral margins washed in brown. Scutellum chocolate-brown except for the light yellow apex. Elytra, clavus entirely dark chocolate-brown; corium also this color, except for the golden-brown explanate costal margin, the lighter brown membrane and a golden or yellow spot just cephalad of apical callous which extends forward on costal margin for a short distance, the entire elytron covered by a golden pubescence. Legs, first two pairs with coxa, trochanter, and femur very dark, except for extreme yellow bases and apices; tibia dark with two light spots on cephalic surface, tarsus dark brown with blackish-brown claws. Hind legs lighter, mottled in dark brown, with tips of spines and tarsal claws black. Mesothorax dark brown. Metathorax brown anteriorly and yellow posteriorly. Abdomen of female yellowish with pygofer dark brown; male abdomen dark brownish-black.

STRUCTURAL DETAILS. Vertex not depressed transversely, anterior margin faintly carinated. Length of one eye over one-fourth total width of head. Ocelli located slightly closer to anterior margin of vertex than pronotum, the distance between the two ocelli a little less than distance between each ocellus

and eye. Front greatly extended beyond vertex, as much as the length of the latter, the head decidedly pointed. Pronotum about twice as wide as long, the anterior margin roundingly angulate, lateral margins subparallel, posterior margin deeply emarginate, the entire surface broken up by numerous fine, irregular wrinkles, resembling those of *osborni*. Scutellum, width three-fifths of length. Elytra, long and narrow, each wing over three times its width, the distance from apex of scutellum to apex of elytron longer in proportion to rest of elytron, thus resembling *osborni* and differing from the other species, the costal margin greatly expanded at base, the outer margins flaring, then parallel-margined for a short distance, from whence they converge to a slender apex, the widest part of body being at a point midway across wing. Wing venation, cell R_5 much longer than wide, cell R_3 smaller than cell first M_4, apical callous large and bulbous, occupying all of cell R_1.

External genitalia: Pygofer of female, length and width about equal, exceeded by ovipositor about one-seventh the length of the latter. Male pygofer wider than long, genital plates broad at base, their mediocaudal angles bluntly rounding, exceeded slightly by genital styles.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, rounding to a sharply pointed apex, the basal laterodorsal half membranous. the ninth sternite about three-fourths the length of the valve. Middle valve flat and bladelike, tapering to a slender pointed apex. Inner valve very broad at base, then tapering to a sharply pointed apex, the two valves united on basal third, the free margins bearing numerous distinct teeth, numbering about eighty-two, and two distinct notches, the one at base of apical third and other one just caudad of middle of valve.

Male genitalia, resembling *proteus,* male styles broad and stout, with base extended into a flap and base of apical portion bearing laterally a recurved hook after which it tapers to a dorsad-curving, sharply pointed apex.

COMPARATIVE NOTES. This species is not readily confused with other species. It resembles *osborni* in regard to the color and wrinkling of the pronotum and the general shape of body, which is long and slender, tapering at both ends. It can be easily distinguished from *osborni,* however, by its striking color and by its great difference in the structure of the male genitalia, which can readily be seen in the drawings. The inner valves of the ovipositor are also considerably different in these two species, the valve in *distincta,* being short, very broad at base and distinctly pointed at apex, with the two notches very close together and about eighty-two teeth between the basal notch and apex. *Osborni,* on the other hand, is a long valve with the notches very far apart and about 105 distinct teeth.

DISTRIBUTION. This species was described from eleven specimens. Four specimens—two males and two females—were taken at Trinidad, Colo., by Dr. C. J. Drake. The holotype was taken by Dr. R. H. Beamer in Coconimo county, Ariz. The other six specimens are in the National Museum and bear the label, Williams, Ariz., which is also in Coconimo county.

LOCATION OF TYPES. Holotype, male, in the Snow collection, University of Kansas. Allotype, female, in the collection of C. J. Drake, Iowa State College, Ames, Iowa.

HOSTS. Unknown.

Clastoptera osborni Gillette and Baker.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera osborni Gill. and Bak. Hemiptera of Colorado, p. 70; 1895.
Clastoptera obtusa subsp. *osborni* Gill. and Bak. Ball, E. D. Proc. Ia. Acad. Sci. III, p. 190; 1895.
Clastoptera obtusa var. *testacea* Fitch. Ball, E. D. Can. Ent. LIX, p. 109; 1927.
Clastoptera obtusa Say. Van Duzee, E. P. Trans. Am. Ent. Soc. XXIV, p. 111; 1903.

SYNONYMY.

In his original paper (1895) Doctor Ball placed this species as subspecies III under *obtusa*. He distinguished it from the rest of the *obtusa* group by the fact that the face was entirely light and the bands on the front obscure. Under this subspecies he had three varieties, the first one olive-green and yellow, which is the true *osborni*, the second one copper-colored, which he thought was synonymous with *testacea*, and the third one black, which he considered the same as *pini*.

In his recent paper (1927) Doctor Ball synonymizes *osborni* with *Clastoptera obtusa* var. *testacea*. The reasons for doing this he gives in the following paragraph:

"Baker insists that *osborni* is a distinct species from *obtusa*, and gives differences in the number of pronotal wrinkles and shape of clavus, neither of which appear to be constant. Van Duzee and Stearns follow Baker, but like him they were not acquainted with the var. *testacea* of Fitch. If this is a distinct species it will still be *testacea* of Fitch and not *osborni* G. and B. Stearns separates *osborni* from all others by the narrow elytra, ignoring the fact that the Colorado forms of typical *obtusa* and all mountain and northern examples of *testacea* have the character equally marked. The only character that is at all constant that the writer finds to separate *osborni* from *testacea* is the lack of black on the bulla, and that appears too trivial to warrant even a varietal status. The writer was in error in calling the subspecies *osborni* as *testacea* has priority; he also erred in including *pini*, which is sufficiently distinct to warrant a separate status."

The writer, on the other hand, has found a number of characters which are constant and yet sufficiently different from *obtusa* to warrant the status of a distinct species. The most evident characteristic is that of the genitalia, which are very dissimilar to that of *obtusa*, as can be seen by the illustrations.

Furthermore, there are sufficient characters available to separate *osborni* from *testacea*, which in turn differs from *obtusa*. In fact the writer thinks that there are three distinct species involved, *osborni*, *testacea* and *obtusa*, with *testacea* standing as the intermediary form between the other two.

ORIGINAL DESCRIPTION.

Female, face two-thirds wider than long, minutely, indistinctly sculptured; clypeus broad at base, gradually tapering to a pointed apex, one-fifth longer than broad, basal suture obsolete, loræ long, nearly as long and half as broad as clypeus; genæ narrow, outer margin concave beneath eyes, convex below the loræ where they are very narrow, touching the clypeus at the broadest part; front but little longer than broad, superiorly very broadly and evenly rounded. Vertex very slightly, transversely depressed, anterior margin carinately elevated, not longer at middle than at eyes. Pronotum transversely wrinkled, minutely scabrous, two distinct pits behind anterior margin near the median

line, three-fourths wider than long, anterior curvature three-eighths of length. Scutellum finely and transversely wrinkled and minutely scabrous, longer than wide. Elytra with a fine, thickly set, golden pubescence, entirely, finely, densely punctured. Color pale rufous throughout, tinged with olive-green on pronotum and clavus, beneath more yellowish. Length, 5.5 mm. Described from two females. Large but somewhat narrower across hemelytra than is usual in this genus.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.95 mm. to 5.5 mm.; ♂ 3.5 mm. to 4 mm. Width: ♀ 2.2 mm. to 2.75 mm.; ♂ 1.66 mm. to 2 mm.

SHAPE. A large, slender species with elytra tapering to a very pointed apex and clavus very long in proportion to rest of elytron.

COLOR. Typically a yellowish, testaceous species, but some forms, especially males, washed in smoky-brown so that they are much darker than the typical form. Front and vertex usually yellow, the latter with an orange-spot laterad and caudad of each ocellus, occasionally entire head washed in smoky-brown. Eyes brownish-grey. Face typically a uniform golden or straw-yellow throughout, postclypeus traversed by nine or more pairs of darker arcs of rufous-tan, but in the darker forms a deep rufous with the arcs in smoky-brown. Pronotum light yellow with central portion underlined with grayish-green, and usually six orange spots on anterior margin, but in the darker forms the entire disc smoky-brown. Scutellum orange-tan on basal two-thirds, rest more light yellow; in the dark series all dark brown. Elytra, yellowish-tan hyaline throughout except where body shows through, making it brownish-gray; those of the dark series a trifle more rufous-brown than typical form. Legs entirely yellow, with dark brown or black spines, occasionally those of the smoky forms washed all over in smoky-brown. Ventral part of body entirely yellow, with ovipositor sometimes washed in smoky.

STRUCTURAL DETAILS. Vertex not depressed transversely, anterior margin not distinctly carinated. Greatest length of eyes almost one-fourth width of entire head. Ocelli located midway between anterior and posterior margins of the vertex, the distance between the two ocelli not quite three-fourths of the distance between each ocellus and eye. Front extending beyond vertex for almost half length of vertex. Postclypeus only slightly inflated, arising gradually from face at sides, its length greater than twice the length of the anteclypeus. Pronotum dull, finely pitted, deeply wrinkled, the wrinkles numerous, irregularly broken up into many smaller ones; cephalic margin roundingly produced, posterior margin deeply emarginate, lateral margins diverging; the greatest length of pronotum being posterior to its laterocaudal angle, and the entire head and prothorax more vertical to rest of body when viewed from the side than in other related species. Scutellum long, its width two-thirds of its length. Elytra scarcely inflated, long and slender, the length of one elytron almost four times its width; clavus very long proportionately, the distance extending beyond the scutellum being almost equal to the length of the scutellum itself and much longer than the membrane, with the width across apex considerably narrowed; base of costal margin flaring, then parallel-margined for half length of elytron from whence it tapers to a narrow, pointed apex, wings covered by a fine pubescence. Wing venation, cell R_5 much longer than

wide, cell R_3 smaller than cell first M_4, apical callous very faint, only slightly elevated, elongate, covering most of cell R_1.

External genitalia: Pygofer of female slightly longer than wide, exceeded by ovipositor about one-seventh of its length; ninth sternite slightly over one-half length of valve, pygofer of male approximately twice its length, laterocaudal angles elongated to form a slender ventrad-curving process, genital plates broad at base, their inner margins rounding, exceeded slightly by genital plates.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a roundingly pointed apex, its ventral basal two-fifths membranous; middle valve flat and bladelike, base not greatly expanded, apex broadly tapering; inner valves flat, bladelike, their inner margins united on basal two-fifths, the free apical inner margins bearing two conspicuous notches, one at point of union of the two valves, the other slightly cephalad of base of apical third, with about 105 conspicuous teeth, those between the two notches broad and shallow, but the apical ones deep, tapering caudad. Male styles broad and stout, base somewhat pointed, median apical half expanded into a broad, recurved flap, whose laterocephalic angle is elongated into a slender, fingerlike process.

COMPARATIVE NOTES. *Clastoptera osborni,* although considered by certain writers as a variety of *obtusa,* is without a doubt a distinct species. The genitalia of the two are decidedly different, as can be observed by a study of the drawings. Several characteristics other than the genitalia are helpful in separating the two. In the first place the color patterns of the face are distinctly different, that of *osborni* being uniformly testaceous, while *obtusa* and its varieties typically have the lower half of the face dark. Then, too, the general testaceous color of the body in *osborni* separates it from anything in the *obtusa* group. The wrinkles of the pronotum are irregular and more numerous than they are in *obtusa,* and the clavus of the elytron in *osborni* is proportionally longer and more narrowed at apex than in *obtusa.*

Superficially *Clastoptera osborni* resembles *Clastoptera testacea* more than any other species. They both have the same general testaceous coloring, with the pronotum tinged with grayish-green, and with the clypeus all yellow. There is one difference in color, however, that of the apical callous, which is always light colored in *osborni* and blackish in *testacea,* standing out in sharp contrast to the rest of the elytron.

Structurally *Clastoptera osborni* and *Clastoptera testacea* differ in several ways. In the first place *osborni* is a large, very slender species with the margins of the elytron almost parallel, or with the widest part of the body anterior to apex of clavus or just back of the pronotum, and with the head and anterior part of the thorax more vertical to rest of body when viewed from the side. *Testacea,* on the other hand, has the margin less parallel than *osborni,* so that the widest part of the body is anterior to tip of clavus but not so far forward as in *osborni.* The wrinkles on the pronotum of *osborni* are very numerous, deep and irregular, so that they can scarcely be counted, while the wrinkles of *testacea* are not so deep and number about twenty-five or more. The pronotum of *testacea* is more or less shiny, while in *osborni* it is decidedly dull. *Osborni* is distinguished from *testacea* and *obtusa* also by the fact that the

pronotum is much longer posterior to its laterocaudal angle than it is from that angle cephalad, but in *testacea* and *obtusa* the distances are about equal. The length of the postclypeus in *osborni* is usually somewhat over twice the length of anteclypeus, and in *testacea* it is usually less than one and one-half times, while in *obtusa* it is usually exactly one and one-half times. The clavus of the elytron in *osborni* is longer in proportion to rest of elytron and more narrowed and pointed at tip than in *testacea*, where it is very broad and rounded. The membrane of the elytron is proportionately much shorter than in *testacea*.

From the above characteristics it can be seen that *C. testacea* is somewhat of an intermediary form between *osborni* and *obtusa*. The genitalia make this even more apparent and prove that there are three distinct species involved. The lateral valve of the ovipositor in *osborni* on the ventral margin has the basal two-fifths membranous, while in *testacea* and *obtusa* at least the basal half is membranous. Also, the sternite of *osborni* is only slightly over one-half the length of the valve, but in *testacea* it is greatly over one-half. The ovipositor in *osborni* protrudes about one-seventh of its length beyond the pygofer, while that of *testacea* protrudes one-ninth. The inner valves of the ovipositors of the three species differ in the following ways: The basal notch on the inner margin is more prominent and the apical notch less prominent in *osborni* than in the other two. The basal notch is located almost exactly midway on valve in *obtusa*, two-fifths of the distance from the base in *testacea* and two-sevenths in *osborni*. The teeth along the inner margins of these valves also differ, those of *obtusa* being finer and more numerous, between 115 and 125, while those of *testacea* and *osborni* are broader and more conspicuous, numbering about 105 in *osborni* and around 85 in *testacea*.

The male genitalia of these forms are likewise specifically different. Those of *osborni* and *testacea* are more nearly alike than those of *obtusa*. The differences can easily be seen by examining the illustrations.

DISTRIBUTION. Stearns (1923) states: "Specimens have been examined from Colorado, New Mexico, Wisconsin and Ohio. It has been reported from West Virginia and the District of Columbia (Ball)."

The writer had specimens at hand from two additional states—Arizona and Texas. Doctor Drake has a large series, 63 in all, taken from Trinidad, Colo. In the Snow collection there is another large series of over 200 specimens from Oak Creek canyon, Arizona, indicating that the species is fairly common in the localities where it is found.

The proportions of the sexes for the total number of specimens at hand seems to be about twice as many females as males, the actual number being 209 females and about 107 males. In individual collections this may vary somewhat. For example, in Doctor Drake's collection there were only 17 females as opposed to 46 males.

LOCATION OF TYPES. One female specimen bearing a red-type label is retained at the National Museum, Washington, D. C. The label states that it is from the collection of C. F. Baker, Colorado Springs; collected by E. S. Tucker, July.

HOSTS. The series from Arizona was collected from pine.

Clastoptera testacea Fitch.

(Plates III, V, IX, XIII, XVII, XXI, XXIV, XXV.)

Clastoptera testacea Fitch. Fitch, Asa. Homoptera, New York State Cab. of Nat. Hist., p. 53; 1851.
Clastoptera pini Fitch. Fitch, Asa. New York State Cab. of Nat Hist., p. 53; 1851.
Clastoptera obtusa subsp. II and III *osborni* Fitch. Ball, E. D. Proc. Ia. Acad. Sci., vol. III, p. 190; 1895.
Clastoptera proteus var. *pini* Fitch. Van Duzee, E. P. Cat. of Hemip.; 1917.
Clastoptera obtusa var. *testacea* Fitch. Van Duzee, E. P. Cat. of Hemip.; 1917.
Clastoptera proteus var. *pini* Fitch. Stearns, L. A. Hemip. of Conn., p. 234; 1923.
Clastoptera obtusa var. *testacea* Fitch. Stearns, L. A. Hemip. of Conn., p. 236; 1923.
Clastoptera obtusa var. *pini* Fitch. Ball, E. D. Can. Ent. LIX, p. 111; 1927.
Clastoptera obtusa var. *testacea* Fitch. Ball, E. D. Can. Ent. LIX, p. 109; 1927.

ORIGINAL DESCRIPTION.

Clastoptera testacea Fitch. Testaceous; scutel rufous; elytra with a polished callouslike black dot near the apex. Length, 0.20 inches. Found on oaks and pines. No. 715, female.

Var. *a*—A black callouslike dot on each side of pectus. No. 716.

Var. *b*—Pectoral dots present, elytra dots wanting. No. 717.

Var. *c*—The black dots wanting, both on elytra and pectus. No. 718.

Clastoptera pini. Black; head yellow, with a black band on the anterior margin of the vertex; thorax with a yellow band anteriorly; elytra with a broad hyaline, outer margin interrupted in the middle and a black callous dot near the apex. Length 0.14. Found chiefly on pines. No. 719, male.

Var. *a*—A ferruginous dot on the apex of the scutel. No. 720.

Var. *b*—A yellow thoracic band widely interrupted. No. 721.

The writer has done an unusual thing, perhaps, by matching *Clastoptera testacea* with *Clastoptera pini,* and giving them a single name, since only female specimens of *testacea* and only male specimens of *pini* have been reported as being found, except for two males of *testacea* and two females of *pini,* which Doctor Ball states are in his collection. But the reasons for thinking that the dark *pini* specimens are the males of the light yellow *testacea* are very convincing. In the first place both species were described by Fitch at the same time from four female specimens of *testacea* and three male specimens of *pini.* He states that *testacea* was taken from oaks and pines and *pini* "chiefly on pines." This seems to indicate that they were taken from the same locality and on the same host plants. Secondly, Dr. W. J. Baerg sent the writer a series of specimens taken from Ithaca, N. Y., bearing labels, lot *a*7 lot *a*3, lot *a*10, indicating that they had probably been reared from the same cage, or at least had been collected from the same places. Twelve of these were typical males of *pini,* and five were typical *testacea* females. Also, Dr. L. A. Stearns sent seven female *testacea* and one male *pini* taken from open woods in Virginia, which were evidently taken together. The writer had at hand for study only thirty-three specimens in all, which represents the number found in the larger Cercopid collections in the country. It is evidently a very rare species. Doctor Ball says that he "beat three males and a female of this rare form (meaning *pini*) along with examples of var. *testacea* from *Pinus virginiana* at Chevy Chase, Md."

A third reason for placing them together is that they resemble each other in certain characteristics, one of the outstanding ones being that the face in

both forms is always entirely yellow. This immediately separates them from the *obtusa* group and links them with *osborni*. The outstanding thing, however, is the genitalia, which show that both *testacea* and *pini* are closely related to *osborni* and are not like *obtusa*. The inner valve of the ovipositor has more the characteristics of the inner valve of *osborni* than that of *obtusa*, while the male genitalia of *pini* are absolutely different from *obtusa*, but somewhat similar to *osborni*. *Clastoptera testacea*, however, differs from *osborni* in a number of ways, so that they cannot be regarded as synonyms, as Doctor Ball thinks. (His opinion in regard to this matter is quoted in the discussion of *Clastoptera osborni*.) In other words, it would seem that *testacea* and *pini* are intermediary forms between *obtusa* and *osborni*, with the ovipositor of *testacea* showing the same degree of gradation between the two other species as the males styles of *pini* do. Therefore it seems logical to link them together.

Although the writer came to this conclusion independently, she is not responsible for the original idea, since later in checking over Doctor Ball's correspondence she found a reference to this matter in one of his letters, which she had completely forgotten, wherein he stated that he has often tried to synonymize these two species as varieties of a distinct species, because of the fact that they both possess the light-colored faces, but that he could find no other good reasons for placing them together. In his 1927 revision of the genus he therefore treated them as separate forms. However, the writer thinks that they should be linked together because of the reasons discussed above. Of course the matter can never be absolutely proven unless mating pairs are taken, which it is to be hoped may sometime be doné.

Since Fitch described *testacea* first in his paper the writer has retained this name for the species. The type specimens in the Albany Museum are somewhat faded, especially those of *pini*, which are no longer black but a light tan. The types of *testacea* were not *osborni*, so there is no possibility of any confusion resulting from them.*

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4 mm. to 4.25 mm.; ♂ 3.25 mm. to 3.33 mm. Width: ♀ 2 mm. to 2.37 mm.; ♂ 1.87 mm. to 2 mm.

SHAPE. A moderately elongate species, with margins of elytra fairly parallel, head and pronotum broad.

COLOR. Female, testaceous, front and vertex golden-yellow, eyes dark. Face entirely yellow, postclypeus with eight or nine pairs of darker arcs, tip of labium dark. Pronotum golden-yellow, or sometimes washed in greenish-brown. Scutellum reddish-tan, fading to grayish-tan at apex. Elytra entirely yellowish-tan hyaline with dark body showing through, making the general appearance through middle darker, apical callous blackish. Mesothorax and metathorax, usually entirely yellow, occasionally two dark brown areas on mesothorax, laterad of labium. Abdomen yellow, ovipositor sometimes dark. Legs yellow, excepting tarsal claws and the spines on tibia and tarsus of last pair.

Male black, front and vertex sulphur yellow with black band on anterior half of vertex. Eyes dark. Face, entirely lemon-yellow, the postclypeus traversed

* By a later examination of his material at the request of the writer, Doctor Ball found that the male specimens of *testacea* were only small female specimens of that form, and that there were no female *pini* specimens in his collection.

by eight or nine pairs of dark tan arcs. Pronotum shining black with a sulphur-yellow band on anterior part. Scutellum black. Elytra, corium dark brown, with a broad clear hyaline area all along costal border and surrounding the black apical callous, interrupted only on middle by narrow extension of the dark brown area, the dark brown portion fading to lighter brown before reaching the hyaline membrane. Mesothorax and metathorax yellow, occasionally two dark brown areas on mesothorax laterad of labium. Abdomen dark brown. Legs yellow, excepting the dark tarsal claws and spines on tibia and tarsus of last pair of legs.

STRUCTURE. Vertex somewhat depressed transversely, anterior margin distinctly carinated. Length of eye about one-fourth total width of head. Ocelli located halfway between anterior and posterior margins of vertex, the distance between the two ocelli being two-thirds the distance between each ocellus and eye. Front extending beyond vertex not more than one-third the length of the latter. Face, postclypeus very slightly inflated, arising gradually from face at sides, its length twice or less than twice length of anteclypeus. Pronotum not greatly elevated, shining, finely wrinkled, the wrinkles not as deep as in the *obtusa* group, and fairly regular in line, its width almost twice its length, anterior margin roundingly produced, posterior margin deeply produced, lateral margins slightly diverging. Scutellum, length about one-third greater than its width. Elytra, length about three times the width of one, only slightly inflated, margins almost parallel, so that the widest part of the body is slightly cephalad of tip of clavus; clavus, normal length, its apex very broad, the portion extending beyond tip or scutellum much less than the length of the scutellum, but almost equal to the length of the membrane; surface covered by fine hairs, numbering less than those of *obtusa* or *osborni;* wing venation, cell R_5 much longer than wide, cell R_3 smaller than cell first M_4 and apical callous prominent, occupying all of cell R_1.

External genitalia: Pygofer of female, length equal to width, the ovipositor protruding beyond tip of pygofer for one-ninth of its length, ninth sternite considerably over one-half length of valve. Male plates divided on median line for two-thirds their length, styles exposed a considerable distance beyond pygofer.

Internal genitalia: Lateral valve broad and spoon-shaped, its ventral basal angle membranous for half length of valve, ninth sternite considerably over one-half length of valve. Middle valve expanded at base, tapering to a pointed apex. Inner valve united for about two-fifths of its length, the free inner margins bearing about eighty-two broad, distinct teeth and two notches, one notch at point of union of the two valves, and another just anterior to base of apical third. Male genitalia, styles very broad, base expanded into a flap, and inner margin of apical fourth expanded into a broad flap whose cephalic angle is elongated into a point; connective broad and roughly triangular; œdagus a thick rodlike structure with apical half curved cephalad.

COMPARATIVE NOTES. This species has been confused with *C. osborni* and *C. obtusa* in the literature. For comparison with *osborni* see the discussion under this heading in the description of the latter.

It differs from *obtusa* externally in that the face is entirely yellow, while *obtusa* typically has the lower half of the face dark, or else mottled; the pronotal wrinkles are deeper and more numerous than in *obtusa;* the hairs on

the elytra are more numerous, and the length of the postclypeus is usually just slightly less than twice the length of the anteclypeus, while in *obtusa* the former is only about one and one-half times the length of the anteclypeus.

For comparison of the valves of the ovipositor of these three species see the discussion in the description of *osborni*.

The males (*pini*) because they are blackish forms, are easily confused with other dark-colored species in the genus. They can be distinguished from all other species by the all-yellow face. In addition to this they can be separated from *C. proteus* var. *osceola*, and *C. saint-cyri* var. *anceps* and *C. hyperici* by having many wrinkles on the pronotum, whereas these species all have few wrinkles. Likewise it is separated by this character from *C. sierra*, *C. binotata*, and the black males of *C. lineatocollis* and *C. brunnea*, all of which have few but deep wrinkles on the pronotum. *C. testacea* (*pini*) is separated from *xanthocephala*, in addition to color pattern of the face by its much larger size.

Lastly the male genitalia separate this species from all the other species very easily. This can readily be seen by examination of plates XXV, XXVI and XXVII. *C. testacea* resembles *C. osborni* in this respect more than any of the other species, but is decidedly different from it also.

DISTRIBUTION. The writer had available for study thirty-one specimens from the following states: Minnesota, New Jersey, New York, North Carolina, South Dakota, Wisconsin, and from Washington, D. C., and Quebec, Canada. Doctor Ball reports it also from Maryland.

Of the thirty-one specimens fourteen were yellow females of the typical *testacea* type and seventeen were males of the black *pini* type.

In a letter to the writer Doctor Ball makes the following remarks: "I have twenty-one females of *testacea* and two males. On the other hand I have three males of *pini* and two females, and one female and two males of *pini* were taken at the same time and place with the *testacea* examples, and the only male of that species taken in the east."

LOCATION OF TYPES. The types of both *testacea* and *pini* are to be found in the New York State Museum at Albany. The specimens are all badly faded, those of the black *pini* males having faded to a light tan or brown, as in the painting. The bullæ of *testacea* are black or dark colored, which proves that Fitch had a form distinct from *osborni*.

HOSTS. In every case where the host plants have been mentioned it has always been pine.

Clastoptera obtusa Say.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

Cercopis obtusa Say. Say, Thomas. Compl. Writ. II, p. 256; 1825.

ORIGINAL DESCRIPTION.

Head and anterior part of thorax pale, with three transverse lines, wings varied with brown and pale. Inhabits United States. Body short, oval; head pale yellowish, an elevated reddish-brown, transverse line between the eyes and before the stemmata; front with about nine parallel equidistant reddish-brown lines which are interrupted in the middle and abbreviated at the cavity of the antennæ; antennæ placed in a deep cavity, beyond which the setæ only

projects; head beneath black, thorax pale, yellowish before, reddish-brown and rugose with continuous lines behind, anterior edge elevated, reddish-brown; a reddish-brown transverse band on the middle; scutel pale, reddish-brown; hemelytra varied with fuscous and pale, generally forming a band.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.65 mm. to 5.1 mm.; ♂ 3.75 mm. to 4.5 mm. Width: ♀ 2.55 mm. to 2.7 mm.; ♂ 2.1 mm. to 2.62 mm.

SHAPE. A somewhat slender species with a broad head and thorax; margins of elytra almost parallel, although the body seems a trifle wider at a point in line with apex of clavus.

STRUCTURAL DETAILS. Vertex depressed transversely, anterior margin somewhat carinated. Greatest length of eye approximately one-fourth the width of head. Ocelli located about midway between anterior and posterior margins of vertex, the distance between the two ocelli almost three-fourths the distance between each ocellus and eye. Front usually extending only slightly beyond vertex, but in a few cases protruding almost half the length of vertex. Face, postclypeus very little inflated, arising gradually from face at sides, its length not much over one and one-half times the length of the anteclypeus, and its width slightly greater than width of gena and eye. Labium reaching to trochanter of middle pair of legs. Pronotum bare and shining, its length a little greater than half its width, about twenty-five regular, deep wrinkles on median line, anterior margin angularly produced, posterior margin deeply emarginate, lateral margins slightly diverging. Scutellum, width about two-thirds of its length, the length being just equal to the distance from tip of scutellum to apex of elytron. Elytra scarcely inflated, length of one not quite three times its width, base of costal margin flaring, then parallel-margined to apical fourth or a point just opposite tip of clavus, from whence it abruptly incurves to rounded apex, their surface covered by many hairs, as compared with other species in the genus; wing venation, cell R_5 rectangular, longer than wide, cell R_3 shorter than cell first M_4, and apical callous irregular in shape, occupying most of cell R_1.

External genitalia: Pygofer about equal in length and width, ovipositor exposed about one-seventh of its length beyond pygofer; male genital plates broad, divided for about three-fourths their length, their inner apical angles rounding; laterodorsal angles of pygofer extended into a long, fingerlike flap, styles exposed for about one-third their length.

Internal genitalia: Lateral valve of ovipositor broad and roundingly pointed at apex, its basal dorsal half greatly membranous, the ninth sternite about two-thirds length of valve; inner valves united for almost half their length, the inner free apical margins bearing small, distinct teeth, numbering between 115 to 125, and two distinct notches, one at point of union of the two valves, and the other at base of apical third; middle valve flat, bladelike, tapering to a pointed apex, its base greatly expanded on cephalolateral angle. Genital styles of males, basal two-thirds broad, apical third narrowed and bent dorsad at an angle with rest of style, the apical angles extended into sharply pointed apices, the caudal one longer than the cephalic one.

Clastoptera obtusa var. *obtusa* Say.

Cercopis obtusa Say. Say, Thomas. Compl. Writ. II, p. 256; 1825.
Clastoptera obtusa var. *pallida* Ball. Ball, E. D. Ia. Acad. Sci. XXVI, p. 145; 1919.

WRITER'S DESCRIPTION.

COLOR. A mottled brown and fuscous species. Vertex pale yellow with light reddish-brown band on anterior margin, posteriorly reaching ocelli. Face, lower half of postclypeus and genæ, mandibular sclerites and anteclypeus all blackish-brown, rest of face light cream-yellow with four or five pairs of blackish-brown arcs on postclypeus cephalad of dark portion, sometimes faint indications of lighter areas along posterior and lateral margins of postclypeus, loræ and anteclypeus, and occasionally these lighter areas, merging to form a light band dividing the dark areas. Pronotum, anterior half pale straw-yellow, excepting a light reddish-tan band on anterior margin and a second darker reddish-brown band posterior to first, the caudal half shading from lighter brown to very dark brown. Scutellum, basal part orange-tan, fading to lighter yellow with extreme apex and base somewhat washed in fuscous. Elytra, mottled in brown, fuscous and white; clavus mottled brown and fuscous with an oblique, usually indistinct or barely discernible, whitish band across middle, corium mottled brown and fuscous, with an oblique white band which is united at the claval structure with the white claval band, and then extends cephalad across middle of corium to costal margin, where it merges into a large white spot, the white band again divided by a narrow oblique brownish-black band and followed posteriorly by a dark fuscous cloud which forms a dark spot on costal margin, from whence it fades into pale hyaline on apical third with the veins standing out in sharp contrast, the explanate costal margin pale hyaline, apical callous black, bordered anteriorly by white and a small white spot in cell just anterior to apical callous. Coxa of first two pairs of legs dark, trochanter yellow with a ventral brown spot, femur dark brown with a whitish spot at apex and sometimes a very faint white line running along cephalic margin, tibia and tarsus washed in a lighter shade of brown, excepting the last segment of the tarsus which is brownish black. Hind legs with somewhat the same pattern but generally lighter, except for the dark spines. Mesothorax blackish, mottled with yellow; anterior part of metathorax dark, rest lighter. Abdomen, segments of the female usually yellow with ovipositor washed in brown; segments of the male dark with the margins yellow.

COMPARATIVE NOTES. *Clastoptera obtusa,* and also its variety *tristis,* may be confused with five closely related species, namely *C. elongata, C. pallidocephala, C. tricincta, C. ovata* and *C. siskiyou.* The *obtusa* forms can usually be separated from these other forms very easily by the color pattern of the face. In *obtusa* the lower half of the face is all dark, blackish-brown, or else somewhat mottled with lighter brown, while these other species all have a light face with an irregular, dark band across the middle.

The inner valves of the ovipositors in these three species differ in the following ways: *Obtusa* has the two notches spaced farther apart than in any of the others, and the distance from the basal notch to apex of the valve is longer than in the others. The only two which approach these proportions in any way are *elongata* and *tricincta.* However, in these two species the valves are longer, different in shape, and with the notches much more distinct than

in *obtusa*. The teeth on the valves likewise vary. *Obtusa* has the most, numbering approximately 115 to 125, while *pallidocephala* and *siskiyou* have about 100, *tricincta* about 109, and *elongata* and *ovata* both have an irregularly jagged edge.

The writer does not consider the variety *pallida* Ball as a distinct variety. It was undoubtedly described from teneral specimens which did not have a chance to color up properly.

DISTRIBUTION. This has been taken from the following states: California, Colorado, Connecticut, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, North Carolina, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, Vermont, West Virginia, Wisconsin, and from Washington, D. C., and Montreal, Canada.

This seems to be one of the commonest forms found in the United States. It appears in fairly large numbers in whatever locality it is taken. In a series of approximately 200 specimens the sexes are about equally divided.

HOST PLANTS. Doctor Osborn (1916) speaks of it as the "alder spittle bug." Doctor Ball (1927) reports if from alder, basswood and willow. In Kansas it has been taken from weeping oak, walnut and pawpaw trees, as well as the grass and shrubbery beneath these trees. Doctor Readio reared adults from nymphs that were feeding on hop horn beam. Van Duzee states that it is taken abundantly on blueberry. Lintner reported it from linden.

Clastoptera obtusa var. *tristis* Van Duzee.

Van Duzee, E. P. Bul. Buf. Soc. Nat. Sci. X, p. 508; 1912.

ORIGINAL DESCRIPTION.

The variety he (Ball) calls *achatina*, as I know from a specimen determined by him, is mostly fuscous, with the vertex and anterior margin of the pronotum narrowly fulvous, the former with a dark line. I propose the name variety *tristis* for this form.

WRITER'S DESCRIPTION.

COLOR. Resembling *obtusa*, except that the ground color is a bronze or golden brown with fewer light markings. Vertex pale yellow with light reddish-brown band on anterior margin, posteriorly reaching ocelli. Face, lower half of postclypeus and genæ, mandibular sclerites, anteclypeus all blackish-brown; rest of face light cream-yellow, with four or five pairs of blackish-brown arcs, sometimes faint indications of lighter areas along posterior, lateral margins of postclypeus, mandibular sclerites and anteclypeus. Pronotum, anterior half pale, straw-yellow, excepting a light reddish-tan band on anterior margin and a second darker reddish-brown band posterior to first, the caudal half shading from lighter brown to very dark brown. Scutellum, basal part orange-tan, fading to lighter yellow, with extreme apex and base somewhat washed in fuscous. Elytra, bronze, or golden-brown, no white band on clavus and only occasionally on corium, where it is barely indicated, posterior to the median, oblique dark band, sometimes the white band being a yellowish-tan, the explanate costal margin pale hyaline, and the apical callous black. Legs and under side of body as in *obtusa*.

COMPARATIVE NOTES. See discussion in the description of the variety *obtusa*.

DISTRIBUTION. Doctor Ball makes the following statement in regard to its distribution: "This form has been taken by the writer on alder at Ames, Iowa, at Kingston, Ontario, in the mountains of Colorado, on the slopes of Mount Shasta, California, and on wild grape in the dense swamps of Florida."

The following is a list of states from which this variety has been collected: Alabama, Arizona, California, Colorado, Iowa, Kansas, Maine, Massachusetts, Michigan, New Jersey, North Carolina, New York, Ohio, Pennsylvania, Florida and from Montreal, Canada.

There seems to be an even distribution of males and females, for the series of 145 specimens at hand for study is divided into 79 females and 66 males.

LOCATION OF TYPES. Collection of E. P. Van Duzee.

HOST PLANTS. From Doctor Ball's statements, given above, it seems that the host plants are probably the same as for *obtusa*. One specimen was collected by Mr. Morrison in the Arnold arboretum, Boston, Mass., from *Tila* sp.

Clastoptera obtusa var. *borealis* Ball.

Ball, E. D. Proc. Ia. Acad. Sci. XXVI, p. 145; 1919.

ORIGINAL DESCRIPTION.

Resembling typical *obtusa* in size and pattern, but much darker. Ground color dark, smoky-brown, with the vertex, anterior half of pronotum, except for a narrow transverse band, and the oblique saddle definitely set off in light creamy or white, in sharp contrast. Described from two examples from Nova Scotia from Doctor Brittain, one from Osceola, Wis., collected by the writer, and one from West Virginia. This is the common form in the Rocky Mountains and northern regions, and extends down along the coasts as far as Washington and San Francisco. It was the only form at hand from California at the time the writer reviewed the genus. The western specimens have the band on the pronotum somewhat broken and the lower part of the face light, thus agreeing fairly well with the description of *lineatocollis* Stål, and were so referred. Since that time dark, smoky forms of the species that was known at that time as *delicata* Uhl. have been found in California, and as Baker suggests, they are undoubtedly the form that Stål described.

WRITER'S DESCRIPTION.

COLOR. A mottled brown and fuscous species, resembling *obtusa* but much darker. Vertex and front yellow, with an orange-brown band on anterior margin of vertex. Eyes brown. Face, lower half of postclypeus, lower half of genæ posterior to antennal cavities, mandibular sclerites and anteclypeus all blackish-brown, rest of face light cream-yellow, crossed by five or six pairs of dark arcs, sometimes faint indications of lighter areas along lateroposterior margins of postclypeus, mandibular sclerites and anteclypeus mottled, occasionally these lighter areas merging to form a faint, light band. Pronotum, anterior half straw-yellow with a light reddish-tan band on anterior margin, and a second narrow, dark reddish-brown band posterior to first, the caudal portion shading from lighter brown to very dark brown. Scutellum, basal third orange-brown, sometimes washed in fuscous, followed by a yellow area, then a band of brown, another area of straw-yellow and apex blackish-brown.

Elytra mottled brown, fuscous and white, clavus with a broad, white, distinct band across middle, rest of clavus dark brownish-fuscous; corium, dark brownish-fuscous with the exception of a broad hyaline area at base of costal margin, the hyaline apical third bearing the well accentuated dark brown veins, a white band across middle of corium beginning at the white band on clavus, then running cephalad across corium to costal margin, these two bands together making a prominent white V on each elytron, an oblique dark brown band running through the white band on corium, which broadens into a large, irregular dark brown spot just before reaching costal margin, apical callous black and prominent. Coxa of first two pairs of legs dark, trochanter yellow with a cephalic brown spot, femur dark brown on cephalic and lateral sides, caudad portion somewhat lighter, a whitish area at apex, tibia and tarsus washed in brown. Coxa of metathoracic legs yellow, trochanter yellow with a cephalic spot, femur and tibia as above, with black spines, the base of each spine surrounded by a definite white area.

COMPARATIVE NOTES. The writer thinks that the reasons for making this a distinct variety are not very substantial. It is true that the extreme dark specimens of this variety and the extreme light specimens of *obtusa* are rather conspicuously different. Yet one can find an endless number of gradations between these two forms. In other words, there is no clear line of demarcation which sets off a large series of *borealis* on one hand and a large series of *obtusa* on the other, as can be done with *tristis*.

Clastoptera obtusa var. *borealis* may be very easily confused with two other species, *C. lawsoni* and *C. arizonana*. The three species are somewhat alike in general color pattern, since they are all dark brownish-fuscous species with a distinct oblique white band across elytra. However, both *lawsoni* and *arizonana* have this band much broader than that of the var. *borealis*. Then, too, *lawsoni* has a shiny, semitransparent, darker pronotum than *borealis* has. Moreover *lawsoni* is a more globose species with the margins of the elytra more expanded at base and diverging than in the *obtusa* form where the margins are more nearly parallel. The front of *lawsoni* is more extended anteriorly than in *obtusa*, while the wrinkles of the pronotum are much broader and less numerous.

Clastoptera obtusa var. *borealis* can be separated from *C. arizonana*, in addition to its having a narrower white band on elytra, by the fact that it is much larger, with a much broader head and pronotum and longer body. The costal margins of the elytron flare slightly more in *borealis* than in this species, and the front is clearly more produced in *arizonana* than in *borealis*, its length in the former being even longer than the vertex, while in *borealis* it is scarcely visible beyond vertex. Also, the wrinkles of the pronotum are much finer and more numerous in *borealis* than in *arizonana*, where they seem to have dark furrows between them.

The male genitalia show very little difference between these three species unless they are placed side by side. Then it can be seen that the styles of *arizonana* are stouter and shorter than those of *obtusa* or *lawsoni*. The inner valves of the ovipositors differ, however, and thus indicate that three species are involved. The valve of *borealis* is much larger in every way and the two notches are spread much farther apart than in the other two. The teeth also

vary, numbering between 115 and 125 in *borealis*, about 96 in *lawsoni* being very faintly indicated between the two notches, and only about 67 in *arizonana*.

DISTRIBUTION. Doctor Ball states that he "has taken nymphs and what appeared to be immaturely colored males of this form in abundance on the beaked hazel brush in shaded areas at Woods Hole, Mass., on July 11, 1925. He has taken this form on alder in the Rocky Mountains, on basswood in Iowa, and on grape in a Florida swamp. It seems to be found most abundantly in damp and shaded situations from Nova Scotia to the Pacific, and south to West Virginia in the Appalachians and Colorado in the Rockies."

From the specimens in the collections at hand for study it seems apparent that *borealis* is found along with *obtusa*. It has been taken from the following states: California, Colorado, Connecticut, Iowa, Kansas, Massachusetts, North Carolina, North Dakota, New Jersey, New York, Michigan and Florida.

In a series of 200 specimens the proportion of the sexes is equal.

LOCATION OF TYPES. In the collection of Dr. E. D. Ball, Sanford, Fla.

HOSTS. Doctor Ball mentioned beaked hazel brush, alder, basswood, and grape. In Kansas they have been taken on oaks, walnut and pawpaw.

Clastoptera achatina Germar.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

Clastoptera achatina Germar. Germar. Zeit. f. Ent. I, p. 87; 1838.
Clastoptera obtusa subsp. I. var. *c*, Germar. Ball, E. D. Ia. Acad. Sci. III, p. 190; 1895.
Clastoptera obtusa var. *achatina* Germ. Van Duzee, E. P. Cat. Hemip., p. 518; 1917.
Clastoptera obtusa var. *achatina* Germ. Stearns, L. A. Hemip. Conn., p. 236; 1923.
Clastoptera obtusa var. *achatina* Germ. Ball, E. D. Can. Ent. LIX, p. III; 1927.

ORIGINAL DESCRIPTION.

Testacea, fronte nigra, elytris ante apicem fuscis, macula submarginali ante apicem nigra, femoribus medio fuscis. Hab. in Pennsylvania, Zimmermann. Two bis 2¼ hr. lang rothgelf oder grau gelf, stirn and Mittleburst, bisweilen auch der Hinter-theil des Bauches schwarz. Deckschilde von der mitte weg bis vor die Spitze Schwarzlichbraun, doch bleibt ein Fleck am Seitenrande heil. Die Ader des vorderrandes fuhrt vor ihrer spitze einem schwarzen Fleck.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.5 mm. to 4.8 mm.; ♂ 3.45 mm. to 4.05 mm. Width: ♀ 2.7 mm. to 2.85 mm.; ♂ 2.25 mm. to 2.4 mm.

SHAPE. A semielongate species with a broad head and pronotum resembling *obtusa*.

COLOR. Front, vertex and pronotum all uniform tawny-yellow, eyes brown. Face yellow, marked as follows: A broad brown band across middle of postclypeus, a large brown spot mesad of band on each gena, a spot caudad of mesocaudal angle of eye, a brown spot on caudal portion of mandibular sclerites and another across anteclypeus, or sometimes all of mandibular sclerites and most of anteclypeus dark brown, with occasionally even the caudal margin of postclypeus somewhat darkened. Scutellum tawny-yellow. Elytra, basal third of clavus and anal margin as far as membrane tawny-yellow, rest of clavus dark fuscous, sometimes with an oblique, indistinct yellow band across middle; corium brownish-fuscous, with an oblique, white band which

is united on claval suture with the white claval band, then extends cephalad across middle of corium to costal margin, the white band again divided by a narrow, oblique brownish-black band and followed posteriorly by a dark, fuscous cloud which fades into a tannish-gray hyaline on apical third with the dark veins standing out distinctly, the explanate costal margin pale hyaline, apical callous dark brown or black. Legs, usually a dusky yellow, coxa of first two pairs dark or mottled, femur and tibia light with a longitudinal dark stripe on lateral and cephalic sides which sometimes are very broad, merging together so that the entire cephalic and lateral sides are dark; tarsus, excepting spines and last segment, light. Hind legs light, excepting spines and last segment, which are black. Mesothorax usually dark. Metathorax light or mottled. Abdomen with segments dark, margined in light.

STRUCTURAL DETAILS. Vertex depressed transversely, anterior margin somewhat carinated. Length of each eye one-fourth width of head. Ocelli located a trifle nearer anterior margin of head than pronotum, the distance between the two ocelli equal to distance between each ocellus and eye. Front extending beyond vertex for approximately one-half its length. Postclypeus only slightly inflated, its length approximately twice length of anteclypeus, its width only slightly greater than gena and eye. Pronotum dull, its length slightly greater than half its width, with eighteen to twenty deep wrinkles along median line, the grooves between them wider than in *obtusa,* anterior margin angularly produced, posterior margin deeply emarginated, lateral margins slightly diverging. Scutellum, length about two-fifths greater than width. Elytra, scarcely inflated, length of one almost three times its width, base of costal margin flaring, then almost parallel-margined to apical third of elytron, from whence it abruptly incurves to rounded apex, their surface covered by many hairs, as compared with other species in the genus. Wing venation, cell R_5 rectangular, longer than wide, cell R_3 shorter than cell first M_4, and apical callous small, usually occupying only basal half of cell R_1, rest of cell thickened.

External genitalia: Pygofer of female about equal in length and width, ovipositor exposed about one-seventh of its length beyond pygofer. Male genital plates broad at base, their inner apical angles rounding, laterodorsal angle of pygofer extended into a long, finger-like flap, styles exposed for about one-third their length.

Internal genitalia: Lateral valve of ovipositor broad and roundingly pointed at apex, its basal dorsal half membranous, ninth sternite two-thirds length of valve; inner valves flat, bladelike, united for almost half their length, the free apical margins bearing small distinct teeth, numbering about ninety-five and two distinct notches, one at point of union of the two valves, the other just posterior to base of apical third. Genital styles of males, basal two-thirds broad, apical third narrowed and bent dorsad at an angle with rest of style, the apical angles extended into sharply pointed apices, the caudal one being longer.

COMPARATIVE NOTES. *C. achatina* has been considered as a variety of *obtusa* by many writers. The writer considers it a distinct species for the following reasons: First, because of its outstanding color, namely, the yellow head and pronotum in *achatina,* which separates it very readily from *obtusa.* Then, too, the wrinkles on the pronotum are less numerous in *achatina,* num-

bering 18 to 20 on median line, while in *obtusa* there are usually about 25. Moreover, the wrinkles are deeper with the grooves between them wider than in *obtusa*. Lastly, the inner valve of the ovipositors of the two species differ, although not as markedly as in other species perhaps. The chief differences are that the valve of *achatina* is more slender and narrow as compared to that of *obtusa* and has fewer teeth, namely, about 95 while those of *obtusa* number between 115 and 125.

DISTRIBUTION. The type locality for this species is given as Pennsylvania. Doctor Ball speaks of it as a "rare species." A series of fifty specimens have been taken in Kansas from Atchison and Leavenworth counties. The specimens from other collections numbered about thirty, making the total number of eighty, of which sixty were females and twenty were males. They have been taken from the following states: Connecticut, Florida, Indiana, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, Pennsylvania, Ohio, Texas, West Virginia, Wisconsin, and from Washington, D. C.

HOST PLANTS. One specimen, collected by Mr. Morrison, in the National Museum collection was taken from the Arnold arboretum, Boston, Mass., on *Tilia* sp.

Clastoptera lawsoni sp. new.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

SIZE. Length: ♀ 4.05 mm. to 4.5 mm.; ♂ 2.4 mm. to 2.62 mm. Width: ♀ 3.45 mm. to 3.9 mm.; ♂ 2.1 mm. to 2.55 mm.

SHAPE. A broad, short, medium-sized species with gradually rounding head and elytra moderately inflated.

COLOR. A yellow and fuscous species with a conspicuous white band across elytra. Head and vertex solid yellow, occasionally two or three pairs of darkish arcs showing on front and two brownish spots on vertex. Eyes brown. Face yellow, with the following dark markings: An irregular brownish band across middle of postclypeus, not extending to margins in some cases and occasionally almost lacking, another brown spot laterad of this on each gena and a brown spot on apex of anteclypeus. Pronotum, semihyaline on central portion with dark body showing through and giving this portion a darker appearance, the outer edges irregularly margined and spotted with opaque yellow, a broad reddish-brown band across middle. Scutellum cream-yellow, washed in orange or sometimes all reddish-tan, occasionally a reddish-brown band at base and a dark arc across middle. Elytra ground color, fuscous, the clavus bearing a broad, distinct white band across middle, corium with this white band continued transversely to costal margin, thus making a shallow white V on each elytron, the explanate costal margin and apical third of elytron hyaline, an oblique dark band across middle of corium partially dividing the white band, another dark spot just caudad of middle of elytron and a darker brownish cloud caudad of white band, apical callous brownish and apical veins somewhat darker brown than rest of elytron. Legs, coxa of first two pairs yellow at base and dark brown at apex, trochanter yellow, with a cephalic brownish spot, femur yellow with a broad brownish band on both cephalic and caudal surfaces, this cephalic band at apex interrupted by a

yellowish, longitudinal spot, tibia brown with a darker brown band indicated on ventral surface, tarsus brown with black claws. Hind leg, coxa and trochanter yellow, femur yellow, with a brown basal ring and a broad band running almost to apex on cephalic surface, tibia mottled fuscous and yellow with apices of spines black. Mesothorax blackish-brown. Metathorax yellow. Abdomen yellow or washed in brown.

STRUCTURAL DETAILS. Vertex not depressed transversely, the anterior margin barely carinated. Length of each eye over one-fourth the width of head. The ocelli located midway between anterior and posterior margins of vertex, the space between the two ocelli about equal to the distance between each ocellus and eye. Front extending beyond vertex about two-thirds length of the latter, gena and front gradually rounding anteriorly from eye, giving the head a characteristic rounded appearance. Postclypeus moderately inflated, its length twice that of anteclypeus, and its width slightly greater than space between its lateral margin and lateral margin of head. Pronotum, width almost twice its length, the anterior margin roundingly angulate, the lateral margins diverging and the posterior margin deeply emarginate, the whole surface very shiny, with comparatively few broad wrinkles, numbering about eleven or twelve on median line. Scutellum, length two-fifths greater than width. Elytra broad and moderately inflated, the length of one about two and one-half times its width, the length of clavus beyond apex of scutellum only three-fifths the length of the scutellum, each elytron narrowed at base, its margins then slightly diverging to a point on line with apex of clavus, from which point it tapers to a bluntly rounded apex. Wing venation, cell R_5 much longer than wide, cell R_3 smaller than cell first M_4, the apical callous small, roughly diamond shaped, occupying only the cephalic portion of cell R_1.

External genitalia: Pygofer of female longer than wide, exceeded by ovipositor for about one-tenth of latter. Pygofer of male, longer than wide, the genital plates divided on median line for about one-half their length, the caudomedian angles tapering toward middle of valve, exceeded by genital styles for about one-half their length.

Internal genitalia: Lateral valve broad and spoon-shaped, tapering to a bluntly pointed apex, the ninth sternite slightly over one-half the length of the valve; middle valve flat and bladelike, tapering to a slender apex; inner valves flat and bladelike, united for half their length, their free inner margins bearing two distinct notches, the one at point of union of the two valves and the other at base of apical third, and about sixteen faintly indicated teeth between the two notches, and about eighty between the apical notch and apex of valve. Internal male genitalia of the *obtusa* type, the style broad and stout, its base expanded into a membranous flap, the basal three-fourths much broader than the apical fourth, with the margins of the former bent together, the narrow apical fourth bent laterad, with its extreme apical angles distinctly pointed.

COMPARATIVE NOTES. For the comparison of *C. lawsoni* with *C. obtusa* var. *borealis* see the discussion in the description of var. *borealis* on page 68.

Clastoptera lawsoni is very similar in appearance and structure to *C. arizonana,* although the two have many characters by which they may be separated. The chief structural differences between these two are as follows: *lawsoni* is a larger, broader species than *arizonana,* with the margins of the

elytra greatly diverging and not parallel, while in *arizonana* they are only slightly flaring and parallel. The front of *arizonana* is greatly extended beyond vertex, more so than in either *obtusa* or *lawsoni*, the curve of the head of the latter being evenly rounded so that front and gena are smoothly joined together, while in *arizonana* the anterior curve is broken at junction of gena and front and the head is more pointed.

In color these two differ, since *arizonana* is a chocolate-brown with the white band across elytra very broad, occupying a third of the length of the corium, while in *lawsoni* this band is distinct, but occupies about one-fifth of the clavus, and the general color of the elytra is a lighter brown. Also, the pronotum of *lawsoni* is very shining, transparent, and with a well marked reddish-brown arc crossing the disk, while in *arizonana* the thorax is less shining, more opaque yellow, with the grooves between the wrinkles dark, a narrow brown band just caudad of anterior margin and a second very narrow one across the disk.

The ovipositors of these two closely related species differ in the following respects: the inner valve of *arizonana* is smaller with its base more expanded, followed by a constriction through middle, which *lawsoni* does not have. Then, too, the distance from the apical notch to apex of valve in *arizonana* is less than this same distance in *lawsoni*. Moreover, *arizonana* has fewer teeth, namely, about sixty-seven, with the ones between the notches as distinct as the rest from last notch to apex, while *lawsoni* has about ninety-six, with the ones between the two notches only faintly indicated. The male genitalia are quite similar, showing little difference except when compared side by side. The styles of *arizonana* as compared with *lawsoni* are stouter and shorter.

DISTRIBUTION. This species has been taken in various parts of Arizona, Dixie, Utah, Los Angeles, Cal., and Kerrville, Tex. The majority of the specimens have been taken in Arizona.

The species was described from thirty females and fifteen males. Fifteen specimens were collected by Doctor Beamer, Doctor Readio and Mr. Anderson from Mescal, Ariz., and four specimens by Doctor Ball from Dixie, Utah. The others were specimens from the National Museum collection, which were collected by Uhler, Coquillett, W. D. Pierce, F. C. Pratt, Barker and Schwarz, and H. G. Hubbard.

HOSTS. On the specimens collected by Hubbard and Pierce are labels stating that they were collected from grape.

Clastoptera arizonana sp. new.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

SIZE. Length: ♀ 3.5 to 3.7 mm.; ♂ 3.52 mm. Width: ♀ 2.17 mm.; ♂ 1.95 mm.

SHAPE. A very small, slender species, parallel-sided with a greatly elongated, enlarged front.

COLOR. A dark-brown and yellow species with a conspicuous broad, white band across elytra. Front yellow, crossed by three or four pairs of reddish-brown arcs. Vertex yellow with a narrow reddish-brown stripe just caudad of anterior margin between the eye and ocellus, another orange spot sometimes present caudad of this. Eyes light brown or tan. Face cream-yellow, with a solid dark brown band extending across postclypeus and gena to eye, there

being cephalad of this on postclypeus six or seven pairs of prominent dark brown arcs, the antennal socket, area caudad of eye and a small spot on anteclypeus likewise dark brown. Pronotum cream with the grooves between the wrinkles dark and two distinct brown bands, the one just caudad of anterior margin which sometimes may be broken up into four rectangular spots, the second band forming a narrow arc just anterior to middle of disk. Scutellum creamy with a large reddish-brown spot at base, and a broad dark V across middle. Elytra, brownish, a broad white oblique band across middle third of clavus, this band continuing across corium to costal margin, explanate costal margin and apical third of corium distinctly hyaline with veins, large bulbous apical callous, and an oblique narrow band running through the white band dark, standing out in sharp contrast to rest of corium, the membrane distinctly whitish-hyaline. Legs mostly dark, with coxa of first pair dark on basal half and rest light brown, trochanter with a large brown spot on cephalic surface, femur with a dark brown longitudinal stripe running down middle and a narrow, yellow longitudinal band on either side of it, tibia blackish-brown with a yellow crescent at base, tarsus dark brown and claws almost black. Second pair of legs similar to first, except the femur which is all dark brown on cephalic surface except for an oblique yellow band at apex. Hind legs with coxa, trochanter, and femur like second pair, tibia brownish with large white spots cephalad of lateral spines, the spines brown with black tips, tarsus brown with blackish claws. Mesothorax dark brown. Metathorax dark brown anteriorly, fuscous-tan posteriorly. Abdomen dark brown laterally, the inner margins of pleura and pygofer of female lighter.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Greatest length of eye somewhat more than one-fourth the width of the head. Ocelli nearer to anterior margin of vertex than pronotum, the space between the ocelli equal to the distance between each ocellus and eye. Front greatly extended beyond vertex, its length longer than vertex. Postclypeus moderately inflated, more so than in *obtusa* and less than in *proteus*, its length somewhat over twice the length of anteclypeus, its width one-third wider than space between its lateral margin and outer margin of head. Pronotum almost twice as wide as long, anterior margin roundingly angulate, posterior margin deeply emarginate, its surface traversed by broad wrinkles on median line with deep furrows between them. Scutellum one-third longer than wide. Elytra, length of one about three times its width, length of clavus beyond apex of scutellum less than one-half length of clavus, base of costal margins only slightly flaring, as compared to *C. lawsoni*, then parallel-margined to apical third of elytron, from whence they taper to a bluntly pointed apex. Wing venation, cell R_5 just slightly longer than wide, cell R_5 smaller than cell first M_4, the apical callous roughly diamond-shaped, prominent, occupying only the cephalodorsal portion of cell R_1.

External genitalia: Pygofer of female longer than wide, only slightly exceeded by ovipositor, approximately one-eighth or one-ninth of valve. Pygofer of male much wider than long, the laterocaudal angles greatly elongated into long slender processes, the genital plates separated on median line for a little over half their length, the mediocaudal angles bluntly rounded, exceeded by genital styles for about half their distance.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly pointed apex, its laterodorsal half membranous, the ninth sternite about three-fourths the length of valve; middle valve flat and blade-like, tapering to a slenderly pointed apex; inner valve flat and blade-like, its base broad, then constricted, from whence it broadens again abruptly, the two valves united on inner margins for half their length, their free inner margins bearing two notches, the one just caudad of point of union of the two valves, and the other at base of apical third, and thirteen distinct teeth between the two notches and about fifty-four between apical notch and apex. Male style, broad at base, margins of the basal two-thirds bent together, the apical third considerably narrowed and bent laterad, the extreme apical angles in the form of sharply pointed hooks.

COMPARATIVE NOTES. See the discussion under this heading in the description of *C. lawsoni* on page 72.

DISTRIBUTION. The species was described from nine specimens, seven of which were males and two females. The females were collected by Dr. P. A. Readio and Dr. F. H. Snow. The males were collected by Uhler, C. F. Baker, Dr. Snow, and Dr. R. H. Beamer.

LOCATION OF TYPES. Holotype and allotype, Snow collection, University of Kansas.

HOSTS. Unknown.

Clastoptera xanthocephala Germar.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

Germar. Zeit. f. Ent., p. 189; 1839.

ORIGINAL DESCRIPTION.

Nigra, capite flavescente, fronits, facia nigra, elytris maculis marginatibus hyalinis, puncta calloso anter apicum nigro, pedibus pallido-fuscaque annulatis.

Habitat in Pennsylvania, Carolina. Zimmerman. One and one-half lin lang. Kopf gelb, under scheitel dunkel, eine qweerbinde auf der unterseite schwarz. Deckshilde schwarz, ein Fleck am vorderrande vor der Spitze, ein anderer, der den ganzen Hinterrand einnimmt, glashell, latzerer mit einem schwarzen schweilegen Punkte vor der Vorderecke. Beine gelblich, braun geringelt.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 2.9 mm. to 3.3 mm.; ♂ 2.4 mm. to 3 mm. Width: ♀ 1.95 mm. to 2.1 mm.; ♂ 1.65 mm. to 2.1 mm.

SHAPE. A short, compact species, with margins of the elytra almost parallel.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Length of each eye slightly over one-fifth the width of the head. Front exposed beyond vertex about two-thirds of the length of the vertex, more roundingly produced than in the *proteus* group. Ocelli located midway between anterior and posterior margins of vertex, with the distance between the two ocelli equal to the distance between each ocellus and eye. Postclypeus very slightly inflated, its width greater than combined gena and eye, length one and three-fourths times the length of anteclypeus.

Pronotum shiny, with about twenty-three fine, even wrinkles, cephalic margin somewhat more produced than in *proteus* group, posterior margin deeply emarginate and lateral margins diverging. Scutellum very long, one-fifth longer than distance from its apex to apex of elytron. Elytra, length approximately two and two-thirds times width of one, base of costal margin flaring, then parallel-margined to apical fourth, from whence it abruptly incurves to rounded apex, covered by a fairly scant pubescence, less than in *salicis* and *hyperici* but more than in *proteus*. Wing venation, cell R_5 about equal in length and width, or slightly wider than long, cell R_3 much smaller and shorter than cell first M_4, apical callous round and bulging, occupying most of cell R_1.

External genitalia: Pygofer of female about equal in length and width, ovipositor extending beyond pygofer for about one-fifth of its length. Pygofer of the male slightly broader than long, its laterodorsal angle expanded into a long, slender, tapering process; male genital plates broad at base, inner margins rounding to a blunt apex, the genital styles scarcely visible beyond plates.

Internal genitalia: Lateral valve of ovipositor tapering to a pointed apex, its length not quite twice the length of the ninth sternite; inner valves united for approximately half their length, the free apical half bearing regular, distinct teeth, numbering seventy-seven to seventy-eight, and two very small inconspicuous notches, one at point of union of the two valves, the other at base of apical third; the middle valve blade-like, expanded into a sharp angle at base and tapering to a pointed apex. Styles of male broad and stout, base extended into a flap, apical fourth bent dorsad, the apical angles both extended into sharply pointed apices, the inner one longer and more sharply pointed than the outer one.

Clastoptera xanthocephala var. *xanthocephala* Germar.

COLOR. A very dark brown, uniformly colored species. Front from above usually yellow washed in dusky. Vertex usually dark brown with the anterior margin somewhat lighter, in some cases being tannish-yellow like the front. Eyes dark brown. Face, postclypeus all yellow, except for four or five pairs of dark arcs on anterior two-fifths, and a conspicuous dark band extending across the middle, mandibular sclerites and anterior half of anteclypeus yellow, rest of face dark brown with the exception of the area anterior to and surrounding the antennæ. Pronotum uniformly dark brown, or sometimes with a lighter brown band across anterior margin. Scutellum dark brown. Elytra uniformly dark brown and shiny except in the following places: A white hyaline spot half way down costal margin, the explanate costal margin anterior to this subhyaline washed in brown, and the extreme apical portion beyond clavus hyaline with the veins and black apical callous standing out in sharp contrast. First two pairs of legs varying from light to dark brown, with a light spot at base of tibia and sometimes another at apex, tibia of hind legs dark brown with a white spot at apex, and rest of segments light or varigated, with dark brown or blackish spines.

COMPARATIVE NOTES. Since this is a blackish form it may easily be confused with any of the other black forms in the genus, such as C. *proteus* var. *osceola*, *C. saint-cyri* var. *anceps*, *C. hyperici*, *C. binotata*, *C. sierra*, and the males of *lineatocollis* and *brunnea*. From all of these, however, it can easily be separated

by the color pattern of the face. In *osceola, anceps* and *hyperici* there is a broad, shining black band on anterior portion of the postclypeus, with the remainder a shining sulphur yellow, while in *binotata* the postclypeus is black crossed by light arcs, and in *sierra* it is all black. On the other hand, *xanthocephala* differs from all of them because the black band extends only across the middle of the postclypeus. *C. xanthocephala* also differs from *osceola, hyperici* and *anceps* in the color pattern of the elytra, since it has a whitish spot half way down on the costal border, which the others lack. *Binotata,* on the other hand, has this spot, too, but can easily be distinguished from *xanthocephala* in that the latter has a more or less shining pronotum with many fine, shallow wrinkles (see drawing) while *binotata* has a dull black pronotum with half as many deep wrinkles. This latter characteristic also distinguishes *sierra* —which is like *binotata*—from *xanthocephala.*

C. xanthocephala differs structurally from the other species in many ways. The ocelli are located farther apart than in *osceola* or *anceps,* the space between the two ocelli in the latter two being about one-half the distance between each ocellus and eye, while in *xanthocephala* these spaces are about equal. The lateral margins of the elytra are parallel in *xanthocephala* and start to curve toward apex at base of apical fourth instead of at base of apical third, as in the others. The scutellum is very long in proportion to the elytra and the membrane of the elytra is proportionately less than in any other of the species, which makes *xanthocephala* look much more blunt than the others.

For discussion of the ovipositors of these species, see page 32 in the description of *binotata.* For comparison of *xanthocephala* with the males of *brunnea* and *lineatocollis,* see page 23.

DISTRIBUTION. *C. xanthocephala* has been taken in the following states: Alabama, Arkansas, Arizona, California, Colorado, Florida, Georgia, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Jersey, New Mexico, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas and Washington, D. C.

Apparently the species is more or less of a southern form, since it has been taken most abundantly in the southern states such as Georgia, Alabama, Mississippi and Texas.

The distribution of the sexes in a series of 581 specimens taken from all over the United States is about equal, with possibly a few more males than females.

HOST PLANTS. The writer has no notes to contribute as to its host plants. Doctor Ball states that he "has found the frothy masses of this species on many different plants in Florida, ranging from shrubs and trees to grass, but its favorite hosts appear to be *Ambrosia* and *Helianthus.*"

Clastoptera xanthocephala var. *unicolor* Fowler.

Clastoptera unicolor Fowler. Fowler. Biol. Cent. Am. Homop. II, p. 205; 1897.

Clastoptera xanthocephala var. *glauca* Heid. Heidemann. Proc. Ent. Soc. Wash. IV, p. 399 fig. 1901.

Clastoptera xanthocephala var. *glauca* Heid. Van Duzee, E. P. Bul. Buf. Soc. Nat. Sci. X, p. 508. 1912.

Clastoptera unicolor Fowler. Van Duzee, E. P. Cat. of Hemiptera. 1917.

NOTES ON SYNONYMY.

Doctor Ball in 1898 mentioned two color varieties of *xanthocephala* which he called A and B, distinguishing them from each other by the fact that the former was black above while the latter was glaucus. Then Heidemann in 1901 found specimens of spittle bugs growing on chrysanthemums. He reared them out and called them *C. xanthocephala* var. *glaucus* Ball. Along with his discussion he published a drawing, although he gave no written, technical description with the drawing. In 1912 Van Duzee published the following account in the Bulletin of the Buffalo Society of Natural Science Vol. X:

"There are two distinct and fairly constant varieties of this species found throughout the southern states. Doctor Ball lists them as varieties '*a*' and '*b*.' The former is typical *xanthocephala* Germar, while the latter is a pale glaucus or grayish form, for which I now propose the above varietal name (*Clastoptera xanthocephala* var. *glauca*)."

But according to McAtee the correct name would be *C. xanthocephala* var. *glauca* Heidemann. The reason for this he sets forth in the following paragraph:

"According to article 25*a* of the International Rules of Zoölogical Nomenclature (further construed in opinion I) and previously long accepted practice among zoölogists, the name *glauca* as used by Heidemann cannot be considered as *nomen nudum* as done by Van Duzee (1912) because it is accompanied by an illustration."

All of this discussion is somewhat unnecessary, however, since, as Doctor Ball (1927) points out, this form is synonymous with *C. unicolor* Fowler (1898). Fowler's written description fits the variety very well. Moreover, he himself states that it is identical with Fitch's *C. arkansasensis,* a manuscript name. *Arkansasensis,* according to the records of systematists, seems to have been synonymous with the variety *glauca* of *xanthocephala.*

ORIGINAL DESCRIPTION.

A small, oblong species, more or less dilated behind, of a uniform, dirty testaceous color (occasionally reddish), with the pronotum faintly impressed with transverse lines, and the tegmina (especially the clavus) more or less distinctly punctured; legs testaceous; underside somewhat pitchy. 3 millum.; lat. 2 millum. Hab., Mexico (Bilimek, in Mus. Vind. Caes.) Vera Cruz (H. H. Smith); Guatemala, San Geronimo (Champion).

This insect appears to be inseparable from *C. arkansasensis* Fitch (in litl.), and is also allied to *Clastoptera rufescens* and *C. xanthocephala* Germar, as well as to *C. testacea* Fitch; the last mentioned is longer, and differs in several particulars.

WRITER'S DESCRIPTION.

COLOR. Front yellow, vertex yellowish-tan washed in brown. Face yellow, postclypeus crossed by a median transverse black band, cephalad of which are four or five pairs of dark brown arcs; most of anteclypeus dark brown, genæ anterior to and surrounding antennal cavities yellow, rest dark brown or black, except the mandibular sclerites, which are yellow. Pronotum mottled tan and dirty brown, lighter on anterior margin. Scutellum reddish dark brown. Elytra tannish-hyaline, becoming clearer on distal third and anterior to apical callous, a clear white spot midway on costal margin, the dark body showing

through, giving a darker cast to the central portion, apical callous black. Legs mottled dark brown and yellow, tarsus of posterior legs yellow with the dark brown spines standing out in sharp contrast. Mesothorax black, metathorax yellow. Abdomen black.

DISTRIBUTION. The variety seems to have a similar distribution with the species. It has been taken from the following states: Alabama, Arizona, Arkansas, Florida, Georgia, Iowa, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Texas, Virginia, and Washington, D. C.

The distribution of the sexes is about equal, the writer having at hand for study 111 females and 91 males.

HOSTS. Apparently the same as for *xanthocephala*.

Clastoptera texana sp. new.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

SIZE. Length: ♀ 4.4 mm. to 4.6 mm.; ♂ 4.2 mm. Width: ♀2.7 mm.; ♂ 2.4 mm.

SHAPE. A fairly large, slender species with front only slightly extended and margins of elytra distinctly parallel, resembling the *elongata* group in size and shape, but more like the *arborina* group in coloring.

COLOR. A yellow, brown and fuscous species with the general color similar to the *arborina* group. Front and vertex yellowish-tan, the latter with anterior golden-brown band reaching ocelli. Eyes brown. Face light yellow, marked as follows: A broad dark brown band across middle of postclypeus, preceded by five or six pairs of dark brown arcs, a brown spot on gena laterad of band between postclypeus and eye, antennal sockets darkened and a central brown spot on anteclypeus. Pronotum with anterior brown border, becoming narrower at sides, followed by a yellow band, then another brown band of equal width, rest dusky-tan. Scutellum yellow with extreme apex dark. Elytra, clavus yellow at base and along elytral margin for half its distance, rest golden-brownish-fuscous except for an irregular oblique light band across middle with a large dark brown spot at apex; corium with a longitudinal yellow spot near base, explanate costal margin and apical third tannish-hyaline, an oblique dark brown band across middle, interrupted before claval suture, partially bordered anteriorly and entirely bordered posteriorly by yellowish-white, a dark fuscous cloud posterior to white band, a dark spot midway on costal margin, veins and apical callous dark brown, bordered in yellow, a distinct yellow spot at apex of cell R_3. Legs yellow washed in light brown, clavus dark brown, spines on hind tibia brownish with black tips. Mesothorax brown through center, lighter at sides. Metathorax yellow. Abdomen yellow.

STRUCTURAL DETAILS. Vertex depressed anteriorly, anterior margin slightly carinated. Length of eye slightly over one-fourth the width of the head. Front extended only slightly beyond vertex, not much over one-third length of vertex. Ocelli located much nearer anterior margin of vertex than pronotum, distance between the two equal to the distance between each ocellus and eye. Postclypeus twice as long as anteclypeus. Pronotum almost twice as wide as long, anterior margin rounding, lateral margins diverging, posterior margin deeply emarginate, its surface crossed by distinct but semishallow wrinkles, numbering about twenty or twenty-one along median line. Scutellum approximately one-third longer than wide. Elytra only slightly inflated, length

of one about three times its width, base of costal margins flaring, then parallel-margined to apical third, from whence they abruptly taper to a blunt apex, surface covered by a relatively short fine pubescence. Wing venation, cell R_5 longer than wide, cell R_3 much smaller than cell first M_4, apical callous roughly rectangular, occupying only part of cell R_1.

External genitalia: Pygofer of female, length and width equal, exceeded by ovipositor by about one-ninth of length of latter. Male genital plates broad at base, inner margins rounding to a blunt apex.

Internal genitalia: Lateral valve of ovipositor broad, spoon-shaped, tapering to a roundingly pointed apex, its dorsobasal angle membranous, ninth sternite approximately two-thirds length of valve; inner valves flat, bladelike, their inner margins united for little over one-third their length, narrowed through middle, then broadened to form a distinct notch, followed by another distinct notch at base of approximate apical third, the margin between the first notch and apex of valve irregularly jagged and notched without distinct teeth. Male styles broad at base, the margins bent together, apical third slender, narrowed just before apex, then broadening out again with apical angles forming sharp points.

COMPARATIVE NOTES. See the discussion under this heading in the description of *arborina*.

DISTRIBUTION. The species was described from three specimens, two females and one male, collected from Devil's River, Texas, by Bishopp and Pratt.

LOCATION OF TYPES. Holotype and allotype, National Museum collection, Washington, D. C.

HOSTS. Unknown.

Clastoptera canyonensia sp. new.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

SIZE. Length: ♀ 4.05 mm. to 4.5 mm.; ♂ 3.52 mm. to 4.12 mm. Width: ♀ 1.95 mm. to 2.4 mm.; ♂ 1.95 mm. to 2.4 mm.

SHAPE. A medium-sized, slender species, with head and thorax more narrowed than in *C. uniformia,* elytra only slightly inflated, their margins parallel.

COLOR. A cream and tan species, one of the lightest colored species in the genus. Front entirely cream, vertex cream, bordered anteriorly by a black band which is broader across middle third. Eyes yellowish-tan. Postclypeus cream with a broad, almost regular blackish band across middle third, five or six pairs of very faint tan arcs cephalad of this, rest of face cream except for antennal sockets, a spot on each gena laterad of transverse band, an elongate spot caudad of each eye, a spot on apex of anteclypeus and sometimes a small spot on line of demarcation between postclypeus and anteclypeus which are dark. Pronotum solid cream, with a conspicuous blackish rectangular spot on each lateral angle and two irregular brownish spots on anterior margin just caudad and somewhat mesad of the eyes. Scutellum cream, with a faint tannish band at base and an indication of a dark shallow V across middle. Elytra uniformly cream and tan, the clavus entirely opaque cream on basal two-thirds, the apical third tinged with tan and the apical vein brown; corium with explanate costal margin light, mesad of which is a tan area, followed by a large wedge-shaped, opaque yellow area which is divided by a very faint

oblique brown band, the rest of elytron tannish-brown, becoming more hyaline near apex, the apical veins and callous, and a small spot in cell first M_4 brown, margined with opaque cream or yellow. Legs, anterior two pairs yellow, marked in dark as follows: Coxa with a conspicuous blackish-brown spot on cephalic surface, a faint spot on trochanter, femur with a broad longitudinal band on cephalic and caudal surfaces which fuse together near apex, leaving a white ring around apex, tibia with a longitudinal black band on cephalic surface fusing with a black basal ring, another short longitudinal bar in the yellow portion, tarsal segments brown with almost black claws. Coxa and trochanter of hind leg cream washed in light brown, femur with two very broad longitudinal dark bands which fuse near apex just anterior to an apical white ring, tibia yellow, spines dark brown with black tips, tarsal segments light except for the last segment, which is washed in brown, and the black spines and claws. Mesothorax brown, darker just laterad of labium. Metathorax yellow. Abdomen yellow with central portion of segments tannish, ovipositor and male pygofer darker.

STRUCTURAL CHARACTERISTICS. Vertex slightly depressed transversely, anterior margin slightly carinated. Length of each eye less than one-fourth the width of the head. Front extending beyond vertex for about two-thirds the length of the latter. Ocelli located nearer anterior margin of vertex than pronotum, the distance between the ocelli practically equal to the distance between each ocelli and eye. Face, postclypeus moderately inflated, its length about twice the length of the anteclypeus and its width slightly greater than distance between its lateral margin and outer margin of the head. Pronotum regularly and semideeply wrinkled, the wrinkles fine, numbering about twenty-three on median line, the anterior margin roundingly produced, the lateral margins diverging and the posterior margin deeply emarginate. Scutellum, width about three-fifths of its length. Elytra covered with a fine, silky pubescence, the length of one about three times its width, the base of costal margin flaring, then parallel-margined for about two-thirds the length of the elytra from whence it tapers to a roundingly pointed apex. Wing venation, cell R_5 much longer than wide, cell R_3 smaller than the cell first M_4, the apical callous very prominent, all of cell R_1 being thickened.

External genitalia: Pygofer of female slightly longer than wide, exceeded by ovipositor very slightly. Pygofer of male wider than long, exceeded by genital styles for about one-half their length, the genital plates separated for about one-half or two-thirds their length, the mediocaudal angles bluntly rounded.

Internal genitalia: Lateral valve of ovipositor broad, spoonshaped, tapering to a bluntly pointed apex, its basal mediolateral angle membranous, the ninth sternite slightly over one-half its length; middle valve flat and bladelike, tapering to a slenderly pointed apex; inner valve flat, bladelike, fairly stout, the inner margins of the two valves united for about one-third their length, their free inner margins bearing numerous fine teeth, numbering about 105, and two distinct notches, the first and less prominent about midway on valve, the other approximately at base of apical third. Male styles broad at base, the margin of the basal two-thirds greatly expanded and folded together, the apical portion much more slender, tapering to a pointed, laterad-curving

apex. Connective roughly triangular, œdagus a long slender rod with two membranous lateral flaps on apical half.

COMPARATIVE NOTES. *C. canyonensia* superficially resembles *C. uniformia.* At first glance the color seems to be similar, but upon closer examination there are noticeable differences. In general *canyonensia* is much lighter, with the black marks on vertex and pronotum sharply contrasting with rest of body. In *uniformia* the black marks are not present and the elytra are considerably mottled with fuscous, thus giving them a much darker appearance. Moreover, the postclypeal band is very distinct in *canyonensia* but greatly reduced and inconspicuous in *uniformia.* Besides these color differences there are many structural ones. In the first place *canyonensia* is much smaller, with its head and thorax narrowed anteriorly, while *uniformia* has a much broader head and thorax. Moreover, the front is more produced in *canyonensia* than in the other, and the pronotal wrinkles, although numbering approximately the same along the median line in both species, are in reality closer together in *canyonensia* since the thorax is smaller in *uniformia.* Then, too, the apical callous is large in *canyonensia,* occupying all of cell R_1, but is smaller and inconspicuous in *uniformia.*

In addition to these external differences the ovipositors show variation. The ovipositor of *canyonensia* is smaller and the distance from its apex to first and second notches relatively longer than in *uniformia.* Lastly, the teeth of *uniformia* appear somewhat larger than in *canyonensia,* although this does not check very easily.

DISTRIBUTION. The entire series from which this species was described was collected from the Grand Canyon, Arizona, about nine hundred feet down in the canyon. A series of 233 specimens were taken, of which 136 were males and 97 females. Four mating pairs were taken in this group.

LOCATION OF TYPES. Holotype and allotype in the Snow collection, University of Kansas, The collectors of this large series were Dr. P. A. Readio, Dr. R. H. Beamer and Mr. L. A. Anderson.

HOSTS. Unknown.

Clastoptera uniformia sp. new.

(Plates III, VI, X, XIV, XVIII, XXII, XXIV, XXVI.)

SIZE. Length: ♀ 4.8 mm.; ♂ 4.5 mm. Width: ♀ 2.7 mm.; ♂ 2.55 mm.

SHAPE. A rectangular species with margins of elytra parallel, broad head and pronotum, and front extended only slightly beyond vertex.

COLOR. A yellowish-tan species with elytra finely mottled with fuscous. Head, front and vertex yellowish-tan. Ocelli and eyes brown. Face entirely yellow except for an irregular, partially formed brown band through middle of postclypeus and a central longitudinal dark stripe on anteclypeus. Pronotum entirely yellow in female, with four small reddish-tan bars caudad of anterior margin; male with a transverse, arcuated brown band faintly indicated across disk. Scutellum entirely yellow or with basal half reddish-brown bordered in yellow, a narrow dark band midway from base, interrupted through middle. Elytra yellow, finely mottled with fuscous, a small brown arc at base of clavus, a narrow, oblique brown band midway on corium, interrupted before claval suture and broadening into a light-brownish spot on costal

margin, veins on apex dark brown, margined in yellow. Coxa and trochanter of first two pairs of legs all yellow, femur yellow with a broad, cephalic dark band, apical portion of band being much darker than basal, tibia yellow with a dark brown ring around base, merging into a longitudinal dark band, another abbreviated dark longitudinal band laterad of this, tarsi yellowish-tan, claws black. Metathoracic leg, coxa and trochanter yellowish, washed faintly in brown, femur yellow with a dark spot midway on lateral margin, tibia brownish tan, spines brown with black tips, their bases surrounded by white, tarsal segments tan, tips of spines and claws black.

STRUCTURAL DETAILS. Vertex slightly depressed on each side of ocelli, anterior margin carinated. Length of each eye less than one-fourth the width of head. Front extending beyond vertex not more than one-half length of vertex. Ocelli located nearer anterior margin of vertex than pronotum, the distance between the ocelli less than the distance between each ocellus and eye. Face, postclypeus only slightly inflated, its length about one-third greater than length of anteclypeus. Pronotum very broad, almost twice as wide as long, regularly and semideeply wrinkled, wrinkles numbering about twenty on median line, anterior margin roundingly produced, lateral margins diverging, and posterior margin deeply emarginate. Scutellum approximately one-third longer than wide. Elytra covered with a fine, silky pubescence, length of one elytron approximately three times its width, scarcely inflated, base of costal margins only slightly flaring, then parallel-margined to apical third of elytron, from whence it tapers to roundingly pointed apex. Wing venation, cell R_5 much longer than wide, cell R_3 considerably smaller than cell first M_4, apical callous not greatly convex, occupying only the basal portion of cell R_1, rest of cell thickened but not protruding.

External genitalia: Pygofer of female slightly longer than wide, exceeded by ovipositor about one-ninth of length of latter. Pygofer of male wider than long, genital plates separated for about three-fourths of their length, mediocaudal angles bluntly rounding, exceeded by style at least one-half of their length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly pointed apex, its basal mediolateral angle membranous, ninth sternite broad and short, slightly over half length of valve; middle valve flat, bladelike, slender, constricted through middle, their inner margins united for about one-third their length, the free margins bearing two notches, the one caudad of base of apical third and the second slightly cephalad of it, the margin between apex of valve and basal notch divided into about 108 caudad-pointing teeth. Male styles broad at base, margins of basal two-third greatly expanded and folded together, apical portion very slender, tapering to a pointed, laterad-curving apex. Connective roughly triangular, œdagus a long, slender red with two membranous lateral flaps on apical half.

COMPARATIVE NOTES. See the discussion under *canyonensia*.

DISTRIBUTION. The species was described from two specimens, a male and a female, collected by Uhler in Arizona.

LOCATION OF TYPES. U. S. National Museum collection, Washington, D. C.

HOSTS. Unknown.

Clastoptera elongata sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 4.8 mm. to 5 mm.; ♂ 4.2 mm. to 4.5 mm. Width: ♀ 2.4 mm. to 2.7 mm.; ♂ 2.28 mm. to 2.4 mm.

SHAPE. A long, slender species with margins of elytra uniformly parallel and little inflated.

COLOR. A brownish-fuscous species marked with yellow and white. Front cream-colored traversed by three or four dark brown arcs. Vertex creamy-yellow with an interior orange-brown band which widens at ocelli. Eyes brownish-gray. Face creamy-yellow with dark brown markings as follows: The antennal sockets, a spot on each gena, the area caudad of each eye, a transverse band across middle of postclypeus which fuses with spots on genæ, four or five pairs of heavy black bands anterior to this band, a small spot on clypeal suture, and a large spot on distal portion of anteclypeus. Pronotum cream-yellow, with caudal third dark, reddish-brown, a red-brown band on anterior margin, sometimes a second brown band with its lateral margin always darker brown, or occasionally this band only indicated at the sides, entirely lacking through middle. Scutellum golden-brown, irregular margined laterally with cream. Elytra, clavus a mottled bronze-brown, with usually a light irregular oblique band indicated across middle, corium a fuscous-bronze or brown, becoming more hyaline on apical third of body and with the following other markings: Explanate costal margin cream hyaline margined faintly in brown, a dark brown oblique band across middle, irregularly margined on both sides with white, the posterior white margin broadening into a white spot on costal margin, the apical callous and veins on distal third and a round spot in cell first M_4 very dark brown, and the cell anterior to apical callous hyaline; legs, coxa and trochanter of anterior two pairs yellow with a dark spot on cephalic surfaces, femur yellow with a very broad, longitudinal dark brown band, tibia mostly dark brown except for a cream-colored crescent near base on cephalic surface and another cream-colored spot at apex, tarsus brownish with last segment darker and tarsal claws almost black. Hind leg with coxa and trochanter tannish, femur with a broad, longitudinal band which becomes much darker toward apex, tibia fuscous with white areas cephalad of the lateral and apical spines, the spines themselves darker with blackish tips, tarsus tannish with black spines. Mesothorax tan on lateral margins, becoming very dark brown laterad of labium. Metathorax tan. Abdomen mottled in fuscous and yellow.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Eyes, their greatest width one-fourth width of head. Ocelli located slightly nearer anterior margin of vertex than pronotum, the distance between the two ocelli about equal to the distance between each ocellus and eye. Front extending beyond vertex for about one-half its width. Postclypeus only moderately inflated, arising gradually from face at sides, its length about twice the length of the anteclypeus. Pronotum distinctly wrinkled, numbering about eighteen or twenty along median line, the wrinkles on caudal part more irregular and broken up than on the cephalic portion, cephalic margin roundingly produced, caudal margin deeply emarginate, and lateral margins short and slightly diverging. Scutellum about one-third longer than wide.

Elytra scarcely inflated, long, slender, the length of one about three and one-half times its width, distance beyond apex of scutellum longer than length of scutellum itself, the elytra covered by a moderately fine pubescence, base of costal margin flaring, then parallel-margined to approximate apical third of elytron from whence it rounds to a somewhat pointed apex. Wing venation, cell R_5 much longer than wide, cell R_3 smaller than cell first M_4, apical callous prominent, occupying all of cell R_1.

External genitalia: Female pygofer, length slightly longer than width, exceeded by ovipositor for about one-fourth length of latter. Pygofer of male about one-third longer than wide, laterocaudal angles greatly elongated to form a slender ventrad-curving process; genital plates broad at base tapering to a roundingly pointed apex.

Internal genitalia: Lateral valve of ovipositor broad, spoonshaped, tapering to a bluntly rounded apex, its ventral basal half membranous; middle valve flat, bladelike, base greatly expanded, then constricted, from whence it broadens out again, after which it tapers to a slender pointed apex. Inner valves flat, bladelike, their inner margins united for about half their length, the free apical margins bearing two conspicuous notches, the one at point of union of the two valves, the other at base of apical third, the margin between the two notches bearing very fine teeth, the rest from the last notch to apex having an irregular jagged edge but no distinct teeth. Males, basal one-half broad, its lateral margins expanded and bent together, the apical third slender, the extreme apical portion bent laterad and tapering to a slender apex. Connective about twice as wide as long, roughly triangular; œdagus a broad, straight rod, the apical half bearing two lateral broad membranous flaps.

COMPARATIVE NOTES. This group of five species, *C. elongata, C. tricincta, C. pallidocephala, C. ovata and C siskiyou,* has caused the writer considerable trouble. Ordinarily the erection of five species resembling each other as closely as these do would not be justifiable. Externally they are exceedingly hard to distinguish, except by color. Yet the ovipositors show differences which are of enough importance to use as specific characters, that is, if the inner valve of the ovipositors in the other species is of taxonomic importance. It is so evident in other species in the genus that the ovipositors have specific value that in order to be consistent one would have to accept the evidence they offer here. Moreover, to find out whether the ovipositors are consistent for a given species or not six slides of *elongata* were made, five from one locality in New Mexico and one from Colorado, and five slides of *pallidocephala* were made. In every case they held true to form.

These five species can be grouped into groups rather easily, based upon certain external characteristics. *C. ovata* and *C. siskiyou* can be separated from the other three in that they are much shorter and broader, and the front extends beyond vertex the length of the vertex itself, while in the other three it extends not over half the length of the vertex.

The three species, *C. elongata, C. pallidocephala* and *C. tricincta,* can be told apart externally only by color. Of the three, *pallidocephala* causes the least trouble. The head and pronotum of this species are typically lighter colored than in the other two. The front, vertex, and pronotum usually are cream-yellow with only occasionally dark markings, occurring in the following

places: An interrupted dark band on anterior margin of vertex, sometimes the beginning of a band on each side of pronotum, which usually is lacking through the middle or sometimes the posterior third of pronotum with a touch of dark, and also four small brownish bars on anterior margin. Besides this, the cephalic dark arcs, which in the other species are usually conspicuous, are very faint in *pallidocephala,* so that the combination of light postclypeus, plus the lack of a band on anterior margins of either vertex or pronotum, distinguishes this from the rest.

C. elongata and *C. tricincta* cannot be readily separated externally. When looking at a series of each species they appear to be different; yet there seems to be no clear-cut character by which the two may be separated. Usually the three anterior bands seem to be more prominent in *tricincta,* which suggested its name. However, this is not always a means of identification, since specimens of *elongata* grade into this. Therefore, it seems that the structure of the inner valves of the ovipositors, plus locality labels, are the only criteria for determining these species correctly.

The five species mentioned above differ in respect to the ovipositors as follows: *C. ovata* and *C. siskiyou* are separated from *C. elongata, C. pallidocephala* and *C. tricincta* by the fact that the distance between the first notch and base of valve in the first two is greater than in any of the others, and that consequently the two notches are much closer together. Moreover, the valves of *siskiyou* and *ovata* are smaller, and for that reason the teeth of *siskiyou* appear finer than those of *tricincta* or *pallidocephala,* although in actual number they are about the same as the others, there being about 100 in both *siskiyou* and *pallidocephala* and 109 in *tricincta. C. siskiyou* and *C. ovata* are separated from each other chiefly by the fact that *ovata* has no distinct teeth from apical notch to apex, but only an irregular, jagged margin. *Elongata* is also separated by this characteristic from *pallidocephala* and *tricincta.* The valves of these last three species are very similar. The differences which can be pointed out are as follows: *elongata* and *tricincta* are more curved or bow out through the middle, while *pallidocephala* does not. Then, too, the notches, particularly the apical one, in the first two are more distinct and protruding than they are in *pallidocephala.* These two facts make *tricincta* more nearly like *elongata.* On the other hand, it resembles *pallidocephala* by having teeth from apical notch to apex, which are lacking in *elongata* where this margin is only irregularly jagged. Lastly, there appear to be a few more teeth in *tricincta* than in *pallidocephala* and the basal notch is nearer the base than in the later. From these observations, it is apparent that *tricincta* is an intermediary form between *elongata* and *pallidocephala,* but differs enough according to the inner valves from either one to be placed by itself.

The males of these five species are all considerably darker than the females, but in general follow the color differences of the females. The male genitalia, as in other species, are of little taxonomic value.

For comparison with *C. obtusa* and its variety *tristis,* see the discussion in the description of *C. obtusa* var. *obtusa* on page 65.

DISTRIBUTION. A large series have been taken from Taos, Taos county, New Mexico, of which forty-four were females and forty-five were males. These

were collected by Dr. R. H. Beamer, Dr. P. A. Readio and Mr. L. A. Anderson. They have also been collected from Colfax county, New Mexico, by Mr. Anderson; from Las Vegas, N. Mex., by Barber and Schwarz; and from Pecos, N. Mex., by C. Heinrich (?). In Colorado they have been collected by C. F. Baker and Uhler; from Poudre Canyon by Dr. P. B. Lawson and Dr. R. H. Beamer; from Estes Park by Dr. C. J. Drake, Mr. Hottes and Professor Severin; and from Pingree Park by Dr. C. J. Drake. One specimen from Gotha Orange, Fla., in the Snow collection, states that it was collected by E. R.

LOCATION OF TYPES. Holotype and allotype in the Snow collection, University of Kansas.

HOST PLANTS. Doctor Beamer reports that the large group collected in Taos, N. Mex., were found on cedar and birch. One specimen collected at Pecos, New Mex., bears a label stating that it was found on *Populus angustifolia*.

Clastoptera pallidocephala sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 4.5 mm. to 5.4 mm.; ♂ 4.2 mm. to 4.8 mm. Width: ♀ 2.4 mm. to 3 mm.; ♂ 2.4 mm. to 2.7 mm.

SHAPE. A rather elongate species, but more robust than *elongata* or *tricincta*, with margins of elytra subparallel.

COLOR. A fuscous bronze and yellow species with head and thorax lighter in color than in any of the closely related species. Front and vertex cream-yellow, occasionally indications of an interrupted dark band on anterior margin of vertex. Eyes yellowish-brown or gray. Face cream yellow, a very dark brown transverse band across middle of postclypeus, which occasionally fades out at sides or else merges with another dark brown spot on gena, six or seven pairs of dark arcs preceding the transverse band, the cephalic three or four pairs being very faint and almost indiscernible; the antennal sockets, area caudad of eyes and lower half of anteclypeus dark brown. Pronotum usually entirely yellow with the beginning of a dark brown band across middle, which becomes very faint as it crosses the disk or is entirely lacking across the middle, and also occasional indications of dark on the distal third or half with four small brownish bars or spots along anterior margin. Scutellum reddish-brown at base with irregular lateral margins, and apex a light yellow. Elytra, clavus uniformly fuscous, occasionally indications of an oblique light band across middle; corium fuscous, except for an oblique dark brown band across middle, prominent dark brown veins, conspicuous apical callous and a round spot in cell first M_4, the explanate costal margin, apical third and membrane hyaline, the oblique dark band bordered by white, which becomes a white spot on costal margin, all of the apical callous and veins margined in white. Legs, coxa and trochanter of first two pairs yellow, with a ventral dark spot on each, femur yellow with a longitudinal dark brown stripe, tibia with a dark ring around base which becomes a ventral, longitudinal dark stripe, another narrow longitudinal bar on lateral surface. The hind legs mottled yellow and fuscous with brownish spines, becoming black at tips. Mesothorax yellow with a large brownish area on each side of labium. Metathorax yellowish. Abdomen mottled light brown and yellow.

Males very much darker, but like females having a light colored head and thorax.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Length of each eye one-fourth width of head. Ocelli located slightly nearer anterior margin of vertex than pronotum, the distance between the ocelli about equal to the distance between each ocellus and eye. Front extending beyond vertex for about one-half its width. Postclypeus only moderately inflated, arising gradually from face at sides, its length about twice the length of the anteclypeus. Pronotum distinctly wrinkled, the wrinkles numbering eighteen or twenty along median line, more irregular and broken up on caudal lobes than on disk, cephalic margin roundingly produced, caudal margin deeply emarginate and lateral margins short and slightly diverging. Scutellum about one-third longer than wide. Elytra scarcely inflated, very long and slender, the length of one about three and one-half times its width, distance beyond apex of scutellum longer than length of scutellum itself, covered by a moderately fine pubescence, base of costal margins flaring, then parallel-margined to approximate third of elytron, from whence they round to a somewhat pointed apex. Wing venation, cell R_5 much longer than wide, cell R_3 smaller than cell first M_4, apical callous prominent, occupying all of cell R_1.

External genitalia: Pygofer of female slightly longer than wide, ninth sternite about three-fifths of length of lateral valves, the latter extending beyond pygofer for about one-seventh of their length. Pygofer of male one-fourth broader than long, its laterocaudal angles elongated to form a slender ventrad-curving process, genital plates broad at base, somewhat tapering caudad, their inner apical angles bluntly rounded, and the genital styles exposed beyond plates for about one-half their length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly rounded apex, its ventral basal half membranous; middle valve flat and bladelike, base greatly expanded, then constricted, from whence it broadens out again, then tapers to a slenderly pointed apex. Inner valves flat and bladelike, their inner margins united for considerably over half their length, the free apical inner margins bearing two conspicuous notches, the basal one at point of union of the two valves and the second at base of apical third of valve, the free margins bearing numerous fine teeth, numbering approximately 100. Male styles, basal part broad, its lateral margins expanded and converging, the apical portion bent laterad and tapering to a slender apex.

COMPARATIVE NOTE. See discussion under *Clastoptera elongata*.

DISTRIBUTION. This species has been taken only from Arizona, California and New Mexico. Only one specimen, a male, was collected in New Mexico by Cocherell. A fairly large series was taken in Oak Creek Canyon, Arizona, by Dr. R. H. Beamer and Dr. P. A. Readio, of which twenty-six were females and thirty-nine males. From Coconimo county, Arizona, six females and seven males were collected by Doctor Beamer and Mr. Anderson, and four specimens were taken by Mr. Anderson in the Grand Canyon. In Uhler's collection in the National Museum there is one specimen labeled from Arizona, and Doctor Ball sent the writer one specimen from Castello, Cal., collected by E. G. Titus.

It would seem, therefore, that this is a restricted species and that the sexes are approximately equal with a slight margin in favor of the males.

LOCATION AND TYPES. Holotype and allotype in the Snow collection, University of Kansas.

HOST PLANTS. Unknown.

Clastoptera tricincta sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 4.5 mm. to 5.4 mm.; ♂ 4.2 mm. to 4.5 mm. Width: ♀ 2.55 mm. to 2.85 mm.; ♂ 2.25 mm. to 2.4 mm.

SHAPE. A long, slender species, with margins of the elytra parallel.

COLOR. A brownish-fuscous or bronze species marked with yellow and white. Front cream-yellow with usually three pairs of dark arcs. Vertex yellow with a reddish-brown anterior margin. Eyes dark brown or greyish-brown. Face, postclypeus yellow, with a transverse black band across middle preceded by seven or eight pairs of distinct brownish-black bands on the antennal cavities, a spot on each gena adjacent to band on postclypeus dark brownish-black. Pronotum cream-yellow with a dark reddish-brown band on anterior margin, followed by a narrow reddish-brown band, and a third broad brown band on caudal two-fifths. Scutellum reddish-brown, margined irregularly with cream-yellow. Elytra, clavus bronze-fuscous, occasionally an indication of a faint oblique light band across middle, corium a fuscous-bronze or brown, becoming more hyaline on apical third of body with the following white and dark markings: Explanate costal margin cream-hyaline, margined faintly in brown, a dark brown oblique band across corium, irregularly margined in white which becomes a white spot on costal margin, the apical callous, veins on distal third and a round spot in cell first M_4 very dark brown, the cell anterior to apical callous pale hyaline. Legs, coxa of first two pairs yellow, mottled in brown, trochanter yellow with a cephalic brown spot, femur yellow with cephalic and caudal dark brown stripes, tibia mostly dark brown or blackish mottled with light, tarsus dark brown with tips of spines and claws almost black. Hind legs lighter, mottled with fuscous and with blackish spines. Mesosternum reddish-tan, metasternum yellow. Abdomen reddish-brown, margined anteriorly and posteriorly with yellow.

STRUCTURAL DETAILS. Same as for *Clastoptera elongata* in regard to general external characteristics.

External genitalia: Pygofer of female, length almost equal to width, ovipositor protruding one-sixth of its length beyond pygofer. Pygofer of male slightly wider than long, its laterocaudal angles elongated to form a slender ventrad-curving process; genital plates broad at base, their inner margins bluntly rounding at apex, exceeded by genital styles at least one-half their length.

Internal genitalia: Lateral valve of ovipositor broad, spoon-shaped, tapering to a bluntly rounding apex, its ventral, basal half membranous. Middle valve flat, bladelike, base greatly expanded, then constricted, from whence it broadens out again, then tapers to a pointed apex. Inner valves flat, bladelike, united on inner margins for half their length, free apical inner margins bearing two conspicuous notches, one at point of union of two valves, the

other at base of distal third, or two-thirds of the distance from base of valve, and numerous fine, regular teeth between the first notch and apex of valve, numbering at least one hundred and nine.

DISTRIBUTION. This species was described from seven females and two males. Three females were collected at Fort Garland, Colo., two from Veta Pass, Colo., and one from Trinidad, Colo. The two males were taken at Fort Garland, Colo. These specimens were taken by Dr. C. J. Drake and Mr. Hottes.

LOCATION OF TYPES. Holotype and allotype in the collection of Dr. C. J. Drake, Iowa State College, Ames, Iowa.

Clastoptera ovata sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 4.65 mm. to 4.8 mm.; ♂ 4.05 mm. to 4.8 mm. Width: ♀ 2.7 mm. to 2.85 mm.; ♂ 2.4 mm. to 2.77 mm.

SHAPE. A short, stout species, much broader than *elongata, pallidocephala* or *tricincta,* and even slightly broader than *siskiyou* which it so closely resembles in other respects.

COLOR. A yellow, golden-brown and fuscous species. Front and vertex cream-colored with three or four pairs of dark arcs and a dark brown band along anterior margin in sharp contrast. Eyes, light brown. Face cream-yellow, a very dark brown band across middle third of postclypeus, preceded by seven or eight pairs of distinct, narrow, dark arcs, the antennal cavities, a large spot on each gena laterad of transverse band, another large spot caudad of each eye and a conspicuous central spot on anteclypeus dark brown, or occasionally the band on postclypeus and spot on anteclypeus much broader and distinct. Pronotum cream-colored, with the anterior margin, a median narrow transverse band and a broad posterior band in light brown. Scutellum orange-brown fading to cream-yellow at apex, with a blackish spot just before apex. Elytra, clavus uniformly bronze or brown with occasional indications of a faint, oblique white band across middle and the area preceding it darker brown; corium mostly bronze-fuscous, becoming hyaline on apical portion with the following markings: An oblique dark brown band across middle, irregularly margined anteriorly and posteriorly with white, this posterior white margin broadening into a distinct white spot on costal border, the explanate costal margin hyaline, as is also the apical third and membrane, with the veins in this region dark brown, standing out in sharp contrast and margined with whitish-yellow. Legs more or less mottled with yellow and dark brown, coxa and trochanter of first two pairs tan, with a dark spot on cephalic surface of each, femur tan, washed in dark brown which forms two longitudinal lines on ventral surface and a dark ring, followed by a cream-colored ring or spot just before apex, sometimes the entire femur dark except for a lateral light stripe; tibia of first two pairs of legs tan, washed in dark brown, which forms a dark spot at base, followed by an oblique white band or crescent, and also another white spot located on apex; tarsus tannish-brown with the tarsal claws very dark brown or blackish. Hind legs yellowish-tan with a dark brown spot on lateral margin of femur sometimes becoming a broad band, spines of tibia and tarsal claws blackish. Mesothorax mostly dark brown, especially on either side of the

labium. Metasternum and abdomen light yellow or with the abdomen also washed in dark.

The males of this species, as in the other species, are considerably darker than the females. They can be distinguished from the males of *siskiyou* by having a distinct band across the pronotum.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin slightly carinated. Length of one eye approximately equal to one-fourth the width of the head. Ocelli located much nearer the anterior margin of the head than to the posterior, the distance between the ocelli about equal to distance between each ocellus and eye. Front extending beyond vertex as much as the length of the vertex. Postclypeus only moderately inflated, arising gradually from face at sides, its length about twice the length of the anteclypeus, and its width about one-third wider than distance from lateral margins to outer margins of head. Pronotum evenly and deeply wrinkled, numbering about seventeen along median line, cephalic margin not greatly produced, lateral margins narrowed at base and slightly diverging, the hind margin semideeply emarginate. Elytra only slightly inflated, the length of one about twice its width and the length beyond apex of scutellum only slightly longer than length of scutellum itself; elytra covered by a median fine pubescence; wing venation, cell R_5 longer than wide, cell R_3 much smaller than cell first M_4, apical callous very prominent, occupying all of cell R_1.

External genitalia: Pygofer of female, length equal to width, exceeded by ovipositor between one-seventh or one-eighth of length of latter. Pygofer of male, length about equal to width, its laterocaudal angles greatly elongated to form a slender ventrad-curving process; genital plates broad at base, tapering to a roundingly pointed apex, exceeded by genital styles about one-half their length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly rounding apex, its laterobasal half membranous; middle valve flat and bladelike, base greatly expanded, then constricted, from whence it broadens out again, then tapers to a slenderly pointed apex. Inner valve flat and bladelike, their margins united for half their length, the free apical inner margins bearing two notches, the first and less prominent at point of union of the two valves and the second at base of apical third, the margin between the two notches bearing very fine teeth, the rest of margin from the last notch to apex having an irregularly jagged edge.

Male styles, basal one-half broad, its lateral margins expanded and bent together, the apical third slender, the extreme apical portion bent laterad and tapering to a slender apex. Connective about twice as wide as long, roughly triangular; œdagus a broad, straight rod, the apical half curving dorsad and bearing two lateral, broad membranous flaps.

COMPARATIVE NOTES. *Clastoptera ovata* resembles the following four species very closely; *C. siskiyou, C. elongata, C. tricincta* and *C. pallidocephala.* Of these four it is more closely related to *C. siskiyou* than any of the others. In fact these two, *C. ovata and C. siskiyou* can be separated from the other three without much trouble by the fact that they are shorter and broader and the front extends beyond vertex as much as the length of the vertex, while in the other three it protrudes not over half the length of the vertex, thus

resembling *C. obtusa* in this respect. For comparison of the ovipositors see the discussion in the description of *C. elongata* on page 86.

Clastoptera ovata and *Clastoptera siskiyou* can only be separated externally by minor differences in color. In *siskiyou* the pronotum is decidedly yellow with only a narrow brown band on anterior margin and a much broader one on posterior part, with no third band crossing the yellow one. In *ovata* there is always a distinct third brown band running through the yellow band, although in one or two male specimens this band was interrupted and somewhat indistinct. Structurally there is, of course, a difference in the ovipositors, the inner valve of *ovata* having a jagged inner margin, while that of *siskiyou* has fine teeth.

DISTRIBUTION. They have been collected from California in the following places: Castello by E. G. Titus; Siskiyou county by E. C. VanDyke; Santa Cruz county and Maria county, collectors unknown. They have also been taken in Oregon by C. F. Baker; Wyoming, collector unknown; and British Columbia by R. P. Currie. The species was described from fourteen specimens, six of which were females and eight males.

LOCATION OF TYPES. Holotype and allotype in the National Museum collection, Washington, D. C.

HOST PLANTS. Unknown.

Clastoptera siskiyou sp. new.

(Plates III, VII, XI, XV, XIX, XXII, XXIV, XXVII.)

SIZE. Length: ♀ 4.5 mm. to 5.4 mm.; ♂ 3.9 mm. to 4.5 mm. Width: ♀ 2.62 mm. to 3.3 mm.; ♂ 2.4 mm. to 2.7 mm.

SHAPE. A shorter species than *elongata, pallidocephala* and *tricincta,* but somewhat more slender than *ovata* although approximating it in length.

COLOR. A golden-brown and yellow species. Front and vertex golden-yellow with the anterior margin of vertex brown, as well as two or three pairs of brown arcs on front. Eyes light gray-brown, sometimes darker. Face creamy, with a dark-brown band across middle third of postclypeus anterior of which are six or seven pairs of distinct dark arcs, the antennal cavities, a spot on each gena just laterad of transverse band, area posterior to each eye, and a spot of varying size on anteclypeus, dark brown. Pronotum yellow with a fairly wide brown band on anterior margin and a very broad brown band on posterior portion, making the median yellow area stand out distinctly, although occasionally a faint indication of a narrow dark brown band across this central yellow band. Scutellum mostly orange-tan, slightly darker at base, with sometimes a dark spot just before apex, extreme apex usually light. Elytra, clavus mottled in fuscous and golden-tan with an oblique white band usually plainly indicated; corium mottled in fuscous and tan, becoming hyaline on apical third, an oblique band across middle, irregularly margined anteriorly and posteriorly with white, this posterior white margin broadening into a distinct white spot on costal border just caudad of middle; explanate costal margin whitish-hyaline, veins at apex, a spot in cell first M_4, and apical callous all dark brown margined with whitish-yellow. Legs ground color golden-yellow, coxa and trochanter of first two pair with a dark spot on cephalic surface, femur with a broad, longitudinal, cephalic brown band, becoming darker near apex, after which there is a white spot, tibia with a dark ring at base, followed by a

crescent-shaped white spot or inverted V, rest washed in brown, tarsus tan with tarsa claws dark brown. Hind leg, coxa and trochanter yellowish-tan, femur tan with apical half washed in dark brown, tibia and tarsus light tan or yellow with spines darker tan, and the extreme tip almost black. Mesothorax yellow with a large dark area on each side of labium. Metathorax yellow. Abdomen a light brown, with segments margined in lighter brown or yellow.

Males much darker, but thorax very characteristic with the plain yellow and brown marking, and the band across the yellow portion entirely lacking.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin carinated. Length of eye about one-fourth the width of the head. Ocelli located nearer anterior margin of vertex than pronotum, the distance between the ocelli approximately equal to the distance between each ocellus and eye. Front usually extending beyond vertex as much as the length of the vertex, sometimes only two-thirds of this length. Postclypeus only moderately inflated, arising gradually from face at sides, its length about twice the length of the anteclypeus, and its width about one-third wider than the distance from its lateral margin to outer margin of head. Pronotum deeply and regularly wrinkled, the wrinkles numbering sixteen or seventeen along the median line, the anterior margin of pronotum roundingly produced, lateral margins diverging and posterior margin deeply emarginate. Elytra only slightly inflated, the length of one about three times its width, their surface covered by a moderately fine pubescence; wing venation, cell R_5 longer than wide, cell R_5 much smaller than cell first M_4, the apical callous very prominent, occupying all of cell R_1.

External genitalia: Pygofer of female, length equal to width, exceeded by ovipositor approximately one-sixth of length of latter; male pygofer, its width greater than length, the laterocaudal angles greatly elongated to form two slender ventrad-curving processes, genital plates broad at base, divided along inner margin for half their length, the mediocaudal angles bluntly rounded, exceeded by genital styles for half their length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped, tapering to a bluntly pointed apex, its laterobasal half membranous, ninth sternite somewhat longer than half the length of the valve; middle valve flat and bladelike, the base greatly expanded, then constricted, from whence it tapers to a slender apex; inner valve flat and bladelike, their margins united for over half their length, the free apical inner margins bearing two notches, the first and less prominent one at point of union of the two valves, and the second at base of apical third, these inner margins also bearing fine teeth, numbering ninety-eight to a hundred.

Male styles, basal one-half broad, its lateral margins expanded and bent together, the apical third slender, with the extreme apical portion bent laterad and tapering to a pointed apex. The connective, width about twice its length, roughly triangular; œdagus a broad, straight rod, the apical half usually curving dorsad bearing two lateral broad, membranous flaps.

COMPARATIVE NOTES. See the discussion of these species under this heading in the description of *C. ovata*.

DISTRIBUTION. This species has been described from fourteen specimens, all of which were taken in Siskiyou county, California, except two specimens which were taken from Los Angeles county, California. Of these fourteen

specimens six were females and eight were males. These specimens bear no collector's labels.

LOCATION OF TYPES. Holotype and allotype in the National Museum collection, Washington, D. C.

HOST PLANTS. Unknown.

Clastoptera arborina Ball.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

Clastoptera obtusa var. *arborina* Ball. Ball, E. D. Can. Ent. LIX; 1927.

ORIGINAL DESCRIPTION.

Size and form of *juniperina* with its testaceous color and black markings. The elytra are washed with smoky with a definite white band running obliquely from the scutellum to the apex of the black line and down it to the costa. Smaller than *obtusa*, with the three transverse reddish-brown bands on vertex and pronotum. Holotype female, allotype male and two paratype females taken by the author on white cedar at Muscatine, Iowa.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 3.3 mm. to 4.1 mm; ♂ 3.15 mm. to 3.75 mm. Width: ♀ 1.8 mm. to 2.1 mm.; ♂ 1.65 mm. to 2.1 mm.

SHAPE. A small, slender species with the front greatly extended beyond vertex in comparison to rest of body.

COLOR. A conspicuously marked drab tan and brownish species. Head, front yellow with three or four pairs of brownish arcs visible from above, vertex yellowish-tan, with anterior margin reddish-brown. Eyes brown or tannish. Pronotum yellow with anterior margin reddish-brown, a prominent dark band setting off the anterior third, this band darker on the sides than through the middle, the area between this band and the anterior band lighter yellow than the portion posterior to it. Face light yellow, the postclypeus with eight or nine pairs of very dark, distinct brown arcs on anterior two-thirds, the posterior three or four pairs united to form a solid dark brown band which usually does not quite reach the lateral margins; the antennal sockets, a dark spot on gena laterad of transverse band, and the area posterior to eye dark brown. Scutellum yellow, with a brown band at base and usually a dark spot on apex. Elytra mottled in cream-yellow, tan and fuscous, the clavus usually with a cream-colored spot on laterobasal angle and an oblique, irregular light band across middle, with the space between these two spots darker than the remainder of the clavus; corium tannish-fuscous with the explanate costal margin and distal third clear hyaline, an oblique dark brown band across middle, bordered in cream anteriorly and posteriorly, the posterior cream margin becoming a large spot on costal margin, with a dark spot posterior to this, the apical callous and veins dark brown margined in yellow. Legs yellow with tarsus washed in dark brown, the tarsal claws and spines almost black, occasionally faint indications of spots on coxæ and longitudinal stripes on femora and tibiæ. Mesothorax very dark brown. Metathorax and abdomen yellow with the ovipositor very dark brown.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin carinated, front extended beyond vertex as much as the length of vertex itself.

The eyes level with vertex, the length of each being about one-fourth the width of the head. Ocelli located an equal distance between anterior and posterior margins of vertex, the distance between the ocelli being less than the distance between each ocellus and eye. Face, postclypeus moderately inflated, not as flat as in *obtusa* group, its length not quite three times the length of the anteclypeus, its width greater than the space between its lateral margin and the outer margin of the head. Pronotum finely and not deeply wrinkled, the wrinkles numbering about twenty along the median line, its anterior margin very roundingly angulate, its lateral margins short and only slightly diverging, the posterior margin deeply emarginate. Scutellum, width about two-thirds of its length. Elytra moderately inflated, the margins subparallel, the length of one about three times its width, the surface of the elytra covered by a fine, short pubescence. Wing venation, cell R_5 about square, cell R_3 smaller than cell first M_4, the apical callous conspicuous, roughly diamond-shaped, not occupying all of cell R_1.

External genitalia: Pygofer of female, length and width about equal, exceeded by ovipositor by about one-fifth length of latter. Male pygofer considerably wider than long, its lateroventral angles greatly elongated to form slender, tapering processes, the genital styles separated for over half their length, mesocaudal angles bluntly rounded, the plates exceeded by the genital styles for half their length.

Internal genitalia: Lateral valve of ovipositor broad and spoon-shaped with bluntly rounded apex, the ninth sternite small, approximately one-half as long as the valve; middle valves flat and bladelike, tapering to pointed apices and broad at base; inner valves short, broad, bladelike, their inner margins united for about one-third their length, the free apical margins bearing two notches, the first at point of union of the two valves, the other at base of apical third, the space between the notches and also between the second notch and apex broken up into very distinct teeth, numbering eighty-one to ninety.

COMPARATIVE NOTES. There are five species which resemble each other very closely, namely, *C. arborina, C. juniperina, C. media, C. newporta* and *C. texana*. They can be distinguished from each other, however, in several ways. *Texana* can be distinguished from all the others by its large size, which approximates that of the *elongata* group rather than this group. Moreover, it is like the *elongata* group in that the front extends very little beyond the vertex. Then, too, it has a much broader head and pronotum than any of the other four species have. But, although it has the color pattern of the *arborina* group and the size and shape of the *elongata* group, the male genitalia is of the *obtusa* type with the apex divided into sharp points in place of the one.

Juniperina is next in size to *texana*, some of the larger specimens being almost as large as those of *texana*, although some are much smaller. This species can be easily distinguished, however, from the other four by its color. In *juniperina* the head and pronotum are usually a solid golden-yellow with only occasionally a faint indication of a transverse brown band. Moreover, the head is distinctly more pointed than in any of the other species, and the wrinkles on the pronotum are much deeper, with the grooves between them being much more prominent than in any of the other species.

Clastoptera newporta, media and *arborina* are more nearly alike, since they are approximately the same size. They differ, however, in that *C. media* is

more slender than the other two, with the margins of the elytra more distinctly parallel. *C. newporta* is the broadest, most blunt species of the three, while *arborina* as a general rule is the smallest. Moreover, in *arborina* the front proportionately is more extended beyond vertex than in the others. There seems to be no outstanding difference in the wrinkles of these species.

In color there are several minor differences. The general tone of *newporta* seems to be more golden and light brown with less fuscous than in the others. The yellow band on the pronotum of this species, as well as in *texana* and in *arborina,* stands out very distinctly. In *media* the yellow band and also the brown band following it are more obscure. On the other hand, in *arborina* the brown band on pronotum, especially at the sides, and the other brown markings on elytra and scutellum, are usually very dark, becoming almost black in some specimens, so that they stand out in sharp contrast to the rest of body.

The male genitalia of these species, with the exception of those of *C. texana,* which definitely places it in the *obtusa* group, are of little systematic value except, perhaps, in a relative way. The ovipositors, however, prove to be of considerable value, as can be seen by a glance at the drawings. *Arborina* has a broad, short valve, with the two notches spaced widely apart and bearing distinct teeth, numbering eighty-one to ninety. *C. newporta* has a short, broad valve also, but with the two notches spaced much nearer together and the teeth numbering about eighty-two. *C. media* has a long, slender valve, distinctly narrowed and constricted through middle, with about seventy-eight distinct teeth. *C. texana* has a valve similar to *media,* in that it is constricted through the middle, but has a jagged, irregular edge instead of distinct teeth. The valve in *C. juniperina* is of medium length and width, similar to *newporta,* but differing in that the first notch is very inconspicuous and rounded, sometimes just barely visible, while in *newporta* it is always distinct. The teeth of *juniperina* are much larger than in any of the others, there being between seventy and eighty, although some of the larger specimens sometimes have ninety.

DISTRIBUTION. This species was described by Doctor Ball from four specimens taken at Muscatine, Iowa. In the Snow collection of the University of Kansas there is a large series of this species taken from Taos, Taos county, N. Mex., a fairly large series from Coconimo county, Arizona, and a smaller series from Poudre canyon, Colo. A few scattered specimens have been taken from Logan county, Utah, Fort Collins, Colo., Yavapai and Oak Creek canyon, Ariz. Also, Professor Severin sent the writer for study eleven specimens from Interior, S. Dak. In all there were available for study some 170 specimens, of which 82 were females and 95 males.

LOCATION OF TYPES. Holotype and allotype and two paratypes in the collection of Dr. E. D. Ball, Sandford, Fla.

HOSTS. Doctor Ball reports it on white cedar.

Clastoptera juniperina Ball.

(Plates III, VII, XI, XV, XIX, XXII, XXIV, XXVII.)

Clastoptera obtusa var. *juniperina* Ball. Ball, E. D. Ia. Acad. Sci. XXVI; 1919.

ORIGINAL DESCRIPTION.

Resembling *testacea* in ground color, but with the addition of a definite pattern of narrow dark lines on the nervures of the posterior part of the elytra, a band from the middle of the costa to just before the claval suture slightly irregular and curving around the bulla, a medium-sized callosity, a crescent at the apex of clavus, and usually an arcuated transverse line setting off the anterior third of pronotum, a line at the base of the scutellum and a very small spot at the extreme tip black. Sometimes a brown cloud extends obliquely across the clavus from before the middle of the scutellum towards the dark line in front of the bulla.

Described from four examples from Palisades, Colo., taken by the writer.

This variety occurs only on the red cedar, and has been found in all stages on that tree throughout the mountain regions of Colorado and Utah. The ground color and dark penciling render this globose species an almost perfect mimic of a dried strobile of this tree.

NOTES ON SYNONYMY.

In regard to this Doctor Ball (1927) writes: "This is a clear cut and very distinct variety, and would be considered as a species if it were not for a few variable forms and its evident relation to the next variety *(arborina)* which is intermediate between this and typical *obtusa*."

The writer has dissected and figured the genitalia of both *juniperina* and *arborina*. The male genitalia are not only entirely distinct from *obtusa* but differ from *obtusa* much more than some of the other well known species, such as *xanthocephala*. The ovipositors, likewise, are distinctly different. Moreover, they are taken out of the *obtusa* group because of the color pattern of the face and the extension of the front.

WRITER'S DESCRIPTION.

SIZE. Length: ♀ 4.2 mm. to 4.8 mm.; ♂ 4.2 mm. Width: ♀ 2.4 mm. to 2.7 mm.; ♂ 2.4 mm.

SHAPE. A medium-sized ovate species with a decidedly pointed head.

COLOR. A golden-yellow species with dark markings on apex of elytron standing out in sharp contrast. Head, front and vertex usually entirely golden-yellow, eyes golden-tan or brown. Face, postclypeus in some cases entirely yellow with nine or ten pairs of faint arcs, sometimes the posterior arcs fused to form two dark spots, sometimes becoming a transverse band, always abbreviated before margins, rest of face all yellow excepting a spot on anteclypeus which may be distinct or very faint. Pronotum usually all yellow, with the anterior margin reddish-tan, and sometimes an indication of a narrow transverse band across the disk. Scutellum yellow, usually a dark band at base and a darker spot at apex, the extreme apical part usually somewhat lighter yellow than the rest. Elytra golden-yellow, clavus usually with a dark cloud on anterior half which is more pronounced in some than in others, its apex bearing a dark arc on the vein just anterior to membrane; corium mottled

golden-tan and fuscous, a dark, oblique band across middle bordered anteriorly and posteriorly with cream, the posterior cream border expanding into a large cream spot on costal margin, the apical third of corium hyaline except for the dark brown veins and apical callous, which are in turn margined by cream, the explanate costal margin also light colored. Legs yellow, with last segments of tarsus, the spines on hind tibia and all the tarsal claws very dark brown. Mesothorax yellow, with a large dark brown area on each half which is more pronounced laterad of labium. Metathorax and abdomen yellow with the ovipositor dark brown.

STRUCTURAL DETAILS. Vertex slightly depressed transversely, anterior margin not distinctly carinated. Front extending beyond vertex at least as much as two-thirds of length of vertex. Length of each eye slightly over one-fourth of the total width of head. Ocelli located halfway between anterior and posterior margins of vertex, the distance between the ocelli being about equal to the distance between each ocellus and eye. Postclypeus moderately inflated, more so than in *obtusa* and *testacea,* arising gradually from face at sides, its length about two and one-half times length of the anteclypeus, and its width slightly wider than the distance between its lateral margin and the outer margin of the head. Pronotum deeply and distinctly wrinkled, the wrinkles uniform, numbering eighteen or twenty along median line. Elytra moderately inflated, narrow at base, their margins then slightly diverging until broadest part is just anterior to apex of clavus, the length of one approximately twice its width; wing venation, cell R_5 longer than wide, cell R_3 much smaller than cell first M_4, the apical callous distinct but occupying only the cephalic half of cell R_1, rest of cell somewhat thickened but not darkened.

External genitalia: Pygofer of female somewhat wider than long, exceeded by ovipositor one-fourth of length of latter. Male pygofer broader than long, exceeded by genital styles for one-half their length; genital plates separated on inner margin for half their length, the mediocaudal angle bluntly rounded.

Internal genitalia: Lateral valve of ovipositor broad, spoonshaped, tapering to a bluntly rounding apex, ninth sternite slightly less than half length of valve, middle valve flat, bladelike, tapering to a slender-pointed apex; inner valves, bladelike, long, narrow, united for approximately one-half their length, the free inner margins bearing conspicuous teeth, numbering between seventy and ninety-six and two notches, a gradually sloping one near point of separation of valves, a second distinctly protruding one just anterior to apical fourth.

Male styles much broader at basal two-thirds, their margins greatly expanded and folded together, apical portion more slender, tapering to a pointed, laterad-curving apex. Connective roughly triangular; œdagus a long slender rod with two membranous lateral flaps on apical half.

COMPARATIVE NOTE. See discussion under this heading in the description of *C. arborina* on page 95.

DISTRIBUTION. In regard to the distribution of this species Doctor Ball states the following: "It has been taken by the writer, abundantly in Colorado and Utah and rarely in Montana, the Bad Lands of North Dakota, West Virginia, Washington, D. C., and Woods Hole, Mass." In addition to the states listed above, this species has been taken in Los Angeles county, California, Arizona and Texas.

The writer had on hand for study eight females and six males, so that the distribution of sexes is apparently about equal.

LOCATION OF TYPES. In the collection of Dr. E. D. Ball, Sanford, Fla.

HOSTS. Doctor Ball says that it occurs on red cedar, "where its color and pattern closely resemble the strobile of this tree."

Clastoptera media sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 3.8 mm. to 4.12 mm.; ♂ 3.57 mm. Width: ♀ 1.9 mm. to 2.2 mm.; ♂ 1.9 mm.

SHAPE. A small, very slender species, with front moderately extended beyond vertex, and margins of elytra parallel.

COLOR. A yellowish-tan and fuscous species, similar in color pattern to *arborina, newporta and juniperina*. Front and vertex golden-tan, with two or three pairs of brownish arcs visible on front, and vertex margined anteriorly with brown. Eyes golden-brown. Face light yellow marked with dark, as follows: Nine pairs of reddish-brown arcs on postclypeus, the posterior three pairs darker, usually united across middle to form a dark blackish-brown spot, a brown spot between postclypeus and eye, a small dark spot in center of anteclypeus, sometimes the area beneath the eye dark brown. Pronotum golden-tan, with a brown band across anterior margin and another across disk. Scutellum brown at base, yellow through middle and apex dark brown. Elytra brownish-tan, clavus with a large light spot on claval suture near base, followed by a large dark fuscous cloud, an irregular whitish-yellow band across middle, a blackish-brown spot at extreme apex; corium, yellow spot near base, explanate costal margin hyaline, an irregular oblique dark-brown band across middle, interrupted before reaching claval suture, partially bordered anteriorly and entirely posterior by cream-yellow, the latter becoming a large cream-yellow spot on costal margin, rest of elytron tannish-hyaline with veins and apical callous dark brown margined in yellow. Legs, coxa and trochanter of first two pairs yellow mottled in brown, femur with two longitudinal bands, one yellow and one brown on cephalic surface, tibia brownish with a narrow yellow longitudinal band; tarsus brown with blackish claws. Hind legs yellow, mottled duly with brown, spines and claws dark brown or black. Mesothorax blackish-brown. Metathorax yellow. Abdomen yellow, ovipositor marked with black.

STRUCTURAL DETAILS. Vertex transversely depressed, anterior margin carinated. Length of each eye more than one-fourth width of head. Front extending beyond vertex a distance equal to length of vertex. Ocelli located nearer anterior margin of head than pronotum, the distance between the ocelli equal to the distance between each ocellus and eye. Postclypeus only slightly inflated, its length nearly three times length of anteclypeus. Pronotum, width one and three-fourths greater than its length, anterior margin roundingly produced, lateral margins greatly diverging, posterior margin deeply emarginate, its surface crossed by many semideep wrinkles, numbering seventeen along median line. Scutellum approximately one and one-half times its width. Elytra scarcely inflated, base of costal margin only slightly flaring, then parallel-margined to apical third of elytron, from whence it tapers to a

pointed apex, covered by a median fine pubescence. Wing venation, cell R_5 longer than wide, cell R_3 considerably smaller than cell first M_4, apical callous roughly diamond-shaped, occupying only part of cell R_1.

External genitalia: Pygofer of female slightly longer than wide, exceeded by ovipositor by about one-sixth of length of latter. Male genital plates broad at base, inner margins rounding to a blunt apex, exceeded by genital plates about one-half their length.

Internal genitalia: Lateral valve of ovipositor broad, spoon-shaped, ninth sternite approximately three-fourths length of valve; inner valves flat, blade-like, united on inner margins for almost half their length, the free margins bearing numerous distinct teeth, approximately seventy-eight, the valves narrowed through middle, then expanding to form a slight rounded notch, another protruding notch at base of approximate apical third. Male styles broad at base with the margins bent together, apical third greatly narrowed, tapering to a slender laterad-curving apex.

COMPARATIVE NOTES. See discussion under this heading in the description of *Clastoptera arborina*.

DISTRIBUTION. Described from five females and one male specimen, collected in Oak Creek canyon, Arizona, by Dr. R. H. Beamer.

LOCATION OF TYPES. Allotype and holotype in Snow collection, University of Kansas.

Clastoptera newporta sp. new.

(Plates III, VII, XI, XV, XIX, XXIII, XXIV, XXVII.)

SIZE. Length: ♀ 3.3 mm. to 4.1 mm.; ♂ 3.3 mm. to 4.01 mm. Width: ♀ 1.9 mm. to 2.36 mm.; ♂ 2.03 mm. to 2.2 mm.

SHAPE. A short, bluntly robust species with the front greatly extended and margins of elytra subparallel.

COLOR. A yellowish-tan and fuscous species, very similar in color pattern to *arborina* and *media*. Front golden-tan with two or three pairs of brownish arcs, vertex golden-tan with anterior margin narrowly bordered in light brown. Eyes grayish-tan. Face light or dirty yellow, marked as follows: A blackish-brown band across middle third of postclypeus, sometimes interrupted at sides and preceded anteriorly by five or six pairs of blackish-brown arcs, a dark spot on gena between transverse band and eye, antennal sockets and central spot on anteclypeus dark brown. Pronotum bordered anteriorly by a brown band which is broadest through middle, followed by a yellow band, then a somewhat narrower brown band which is sometimes much darker on sides than through middle, rest dusky-tan through middle. Elytra, clavus with a large, light spot on claval suture near base, followed by a large dark fuscous cloud, an irregular yellow band across middle, rest tannish-fuscous with a dark-brown spot on apex; corium, a yellow spot near base, explanate costal margin hyaline and irregular, oblique dark band across middle of corium, partially bordered anteriorly and entirely posteriorly by yellow, which becomes a large yellow spot on costal margin, followed by a smaller dark spot and a brown cloud just before inflated part of elytron, rest tannish-hyaline with veins and apical callous dark brown, margined in opaque yellow. Legs, coxa of first two pairs dark brown, trochanter brown with yellow margin, femur yellow with a

longitudinal brown band on cephalic surface, interrupted before base at apex, tibia yellow with a longitudinal light-brown band, tarsus brownish with black claws. Hind legs mostly yellow, washed in light brown, tips of spines and claws black. Mesothorax dark brown through middle, yellow at sides. Metathorax yellow. Abdomen all yellow, or with segments sometimes darker through the middle, ovipositor and genital plates dark.

STRUCTURAL DETAILS. Vertex transversely depressed, anterior margin distinctly carinated. Width of the head about three and one-half times the length of one eye. Front extending beyond vertex as much as length of vertex. Ocelli located much nearer anterior margin of vertex than pronotum; the distance between the ocelli equal to or slightly less than the distance between each ocellus and eye. Postclypeus moderately inflated, its length three times the length of the anteclypeus. Pronotum almost twice as wide as long, anterior margin roundingly produced, posterior margin deeply emarginate, lateral margins diverging, the disk crossed by semideep wrinkles, numbering about nineteen or twenty along median line. Scutellum, length about one and one-half times its width. Elytra slightly inflated, the length of one either two or two and one-half times its width, base of costal margin only slightly flaring, then almost parallel-margined to apical third of elytra, from whence it abruptly tapers to a blunt apex. Wing venation, cell R_5 longer than wide, cell R_3 considerably smaller than cell first M_4, apical callous usually long and narrow occupying the dorsal half of cell R_1.

External genitalia: Pygofer of female slightly wider than long, exceeded by ovipositor about one-sixth of length of latter. Male genital plates broad at base, their inner margins rounding to a blunt apex, exceeded by genital styles for about one-half their length.

Internal genitalia: Lateral valve broad, spoon-shaped, its dorsobasal margin membranous for half its length, ninth sternite two-thirds the length of the valve; inner valve flat, bladelike, their dorsal margins united for almost half their length, the free margins bearing two notches, one at a point of union of the valves and the other at the base of the apical third, the free margin between first notch and apex of valve broken up into large, sharply pointed teeth, numbering about eighty-two. Genital styles broad at base, their lateral margins folded together, apical third greatly narrowed, tapering to a lateradcurving, sharply pointed apex; connective roughly triangular, œdagus a slender rod with apical portion curving dorsad and bearing a large membranous flap on each side.

COMPARATIVE NOTES. See discussion under this heading in description of *C. arborina*.

DISTRIBUTION. This is an eastern species apparently. Specimens have been collected from Connecticut by Uhler; Lakehurst, N. J., by E. L. Dickerson; Lake George, New York, by J. L. Zabriskie; and Newport, R. I., by Uhler.

The species was described from six females and five males.

LOCATION OF TYPES. Holotype male, and allotype female, American Museum of Natural History.

BIBLIOGRAPHY.

BAKER, C. F. Notes on *Clastoptera* (Cercopidæ). Ent. News XI, p. 463; 1900.

BALL, E. D. A study of the genus *Clastoptera*. Proc. Ia. Acad. Sci. III, pp. 182-193; 1895.

——— Notes on Cercopidæ, with descriptions of some new species. Ia. Acad. Sci. XXVI, pp. 143-149; 1919.

——— The genus *Clastoptera* (Cercopidæ). Can. Ent. LIX, pp. 103-112; 1927.

BARBER, H. G. Hemiptera of Florida. Bull. Amer. Mus. of Nat. Hist., p. 529; 1914.

FITCH, ASA. Homoptera. N. Y. St. Cab., p. 53; 1851.

FOWLER, W. W. Homoptera II. Biologia Centrali-Americana, p. 198; 1897.

GERMAR, E. F. Zeit. fur die Ento., p. 187; 1838.

GILLETTE, C. P., and BAKER, C. F. List of Hemiptera of Colo., p. 71; 1895.

GODING, F. W. Synopsis of subfamilies and genera of North American Cercopidæ. Bull. Ill. St. Lab. Nat. Hist., p. 483; 1895.

HEIDEMANN. *Clastoptera xanthocephala*, habits. Proc. Ent. Soc. Wash. IV, pp. 399-402; 1901.

LALLEMAND. Homoptera, family Cercopidæ. Genera Insectorum, p. 143; 1912.

LINTNER, J. A. Fourth report of New York state entomologist, p. 242; 1889.

——— Eighth annual report New York state entomologist, p. 152, 1893.

MCATEE, W. L. Cercopidæ of the vicinity of Washington, D. C., with descriptions of new varieties of *Clastoptera* (Homoptera). Proc. Bio. Soc. of Wash. 33, pp. 171-176; 1920.

METCALF, Z. P. The wing venation of the Cercopidæ. Annals Ent. Soc. Amer. X, pp. 27-34; 1916.

OSBORN, HERBERT. The phylogeny of Hemiptera. Proc. Ent. Soc. of Wash. III, pp. 185-190; 1895.

——— Studies of the life histories of froghoppers of Maine. Maine Agric. Exp. Sta. Crono. 254, pp. 254-288; 1916.

PROVANCHER, LEON. Petite faune entomologique du Canada. Vol. III, Hemipteres; 1885.

——— Nat. Can. IV, p. 351; 1872.

SAY, THOMAS. The complete writings of Thomas Say on entomology of North America. Edited by John LeConte. Vol. II; 1825.

STAL, CARL. Of. Vet. Akad. Forh., XI, p. 253; 1854.

UHLER, P. R. List Hem. Reg. West Miss. River. Bull. U. S. Geol. Geog. Surv. Ter. V; 1876.

VAN DUZEE, E. P. Hemiptera from Muskoka Lake, District of Canada. Can. Ent. XXI, p. 8; 1889.

——— Synonymy of the Homoptera described by Say, Harris and Fitch. Psyche V, pp. 387-391; 1890.

——— A list of Hemiptera of Buffalo and vicinity. Bull. of Buff. Soc. of Nat. Sci. V, p. 193; 1894.

——— Insects taken at Beulah, New Mex. Trans. Ann. Ent. Soc. XXIX, p. 111; 1903.

——— List of Hemiptera taken in Adirondack mountains. Twentieth Report of N. Y. State Entomologist, p. 553; 1905.

——— Hemipterological gleanings. Bull. Buff. Soc. Nat. Sci. X, 506-509; 1912.

WIRTNER. Ann. Carn. Mus. III, p. 217; 1904.

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EXPLANATION OF PLATES.

PLATE III.

FIGS. 1 to 13. Lateral view of head.

PLATE III.

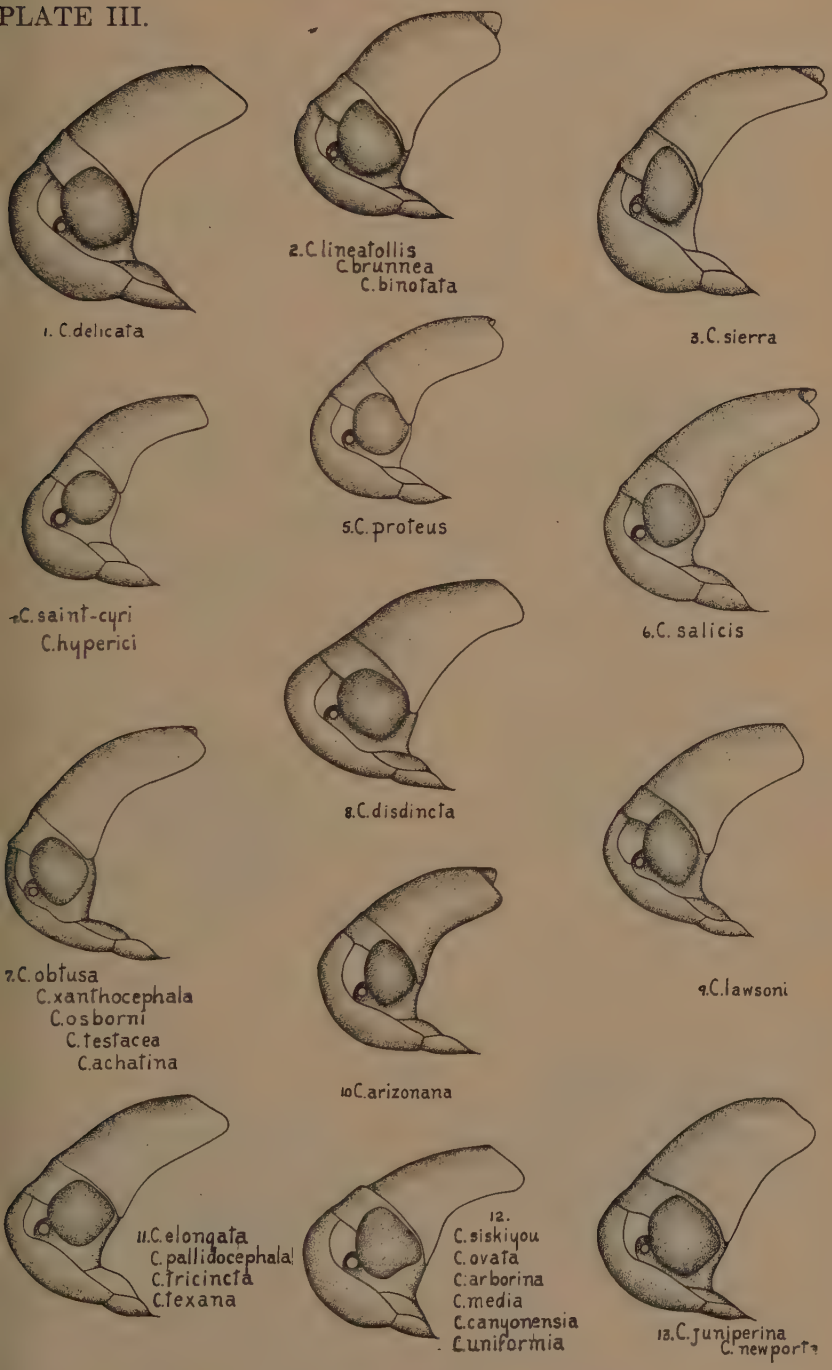

1. C. delicata
2. C. lineatollis
C. brunnea
C. binotata
3. C. sierra
4. C. saint-cyri
C. hyperici
5. C. proteus
6. C. salicis
7. C. obtusa
C. xanthocephala
C. osborni
C. testacea
C. achatina
8. C. disdincta
9. C. lawsoni
10. C. arizonana
11. C. elongata
C. pallidocephala
C. tricincta
C. texana
12.
C. siskiyou
C. ovata
C. arborina
C. media
C. canyonensis
C. uniformia
13. C. juniperina
C. newporta

PLATE IV.

FIG. 1. Ventral view of head. Typical *delicata* type.

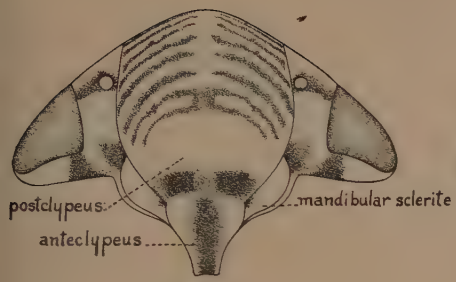
FIG. 1*a*. Ventral view of head. Only occasional specimens of this type.

FIG. 2. Ventral view of head. Typical *lineatocollis* type for females and light colored males.

FIG. 2*a*. Ventral view of head. Typical type for black males.

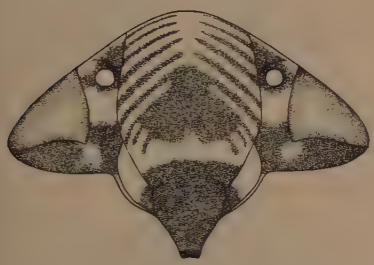
FIGS. 3 to 6. Ventral view of head. Typical type.

PLATE IV.

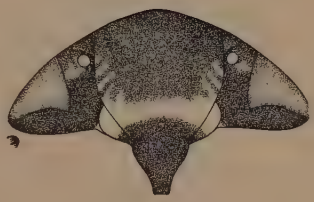


1. C. delicata

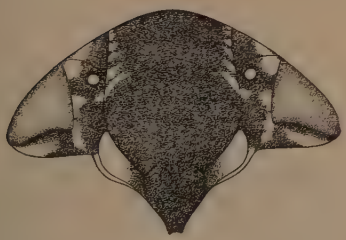
1a



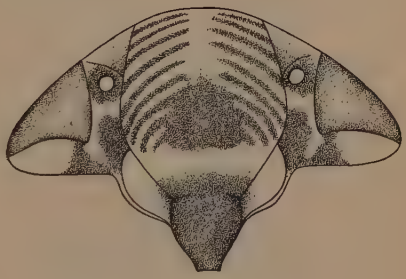
2. C. lineatocollis



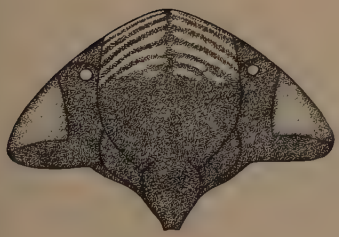
2a - Black male



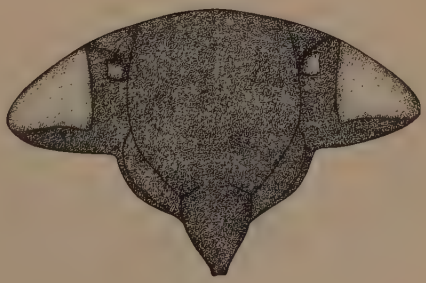
3. C. brunnea



4. C. lugubris



5. C. binotata



6. C. sierra

PLATE V.

FIG. 1. Ventral view of head.
FIG. 1*b*. Ventral view of head. Variation from typical type.
FIGS. 2 to 9. Ventral view of head.

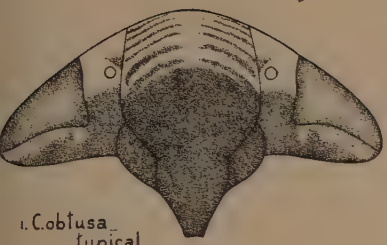
PLATE V.

1. C. salicis
1b
2 C. proteus var. nigricollis
3 C. proteus
4. C. saint-cyri var anceps
5. C. saint-cyri
6. C. distincta
7. C. hyperici
8. C. testacea
9. C. osborni

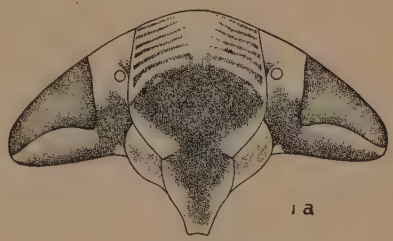
PLATE VI.

FIG. 1. Ventral view of head.
FIG. 2. Ventral view of head. Occasional forms.
FIGS. 1 to 8. Ventral view of head. Typical forms.

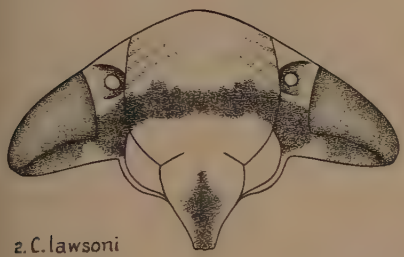
PLATE VI.



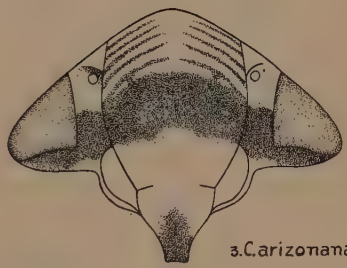
1. C. obtusa
-typical-



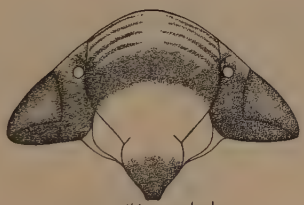
1 a



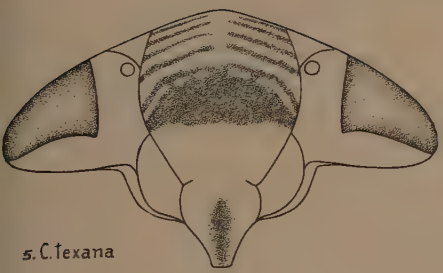
2. C. lawsoni



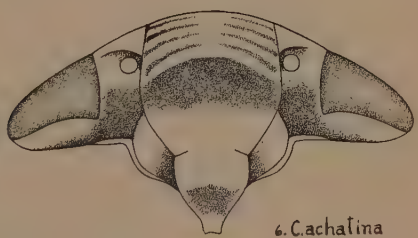
3. C. arizonana



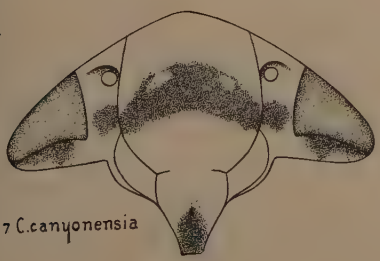
4. C. xanthocephala



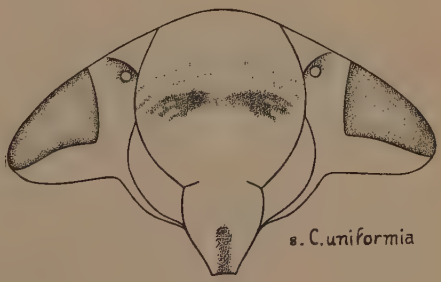
5. C. texana



6. C. achatina



7 C. canyonensia



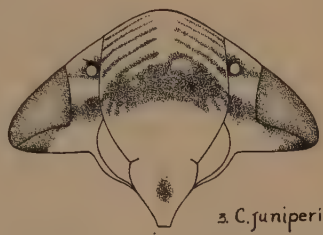
8. C. uniformia

PLATE VII.

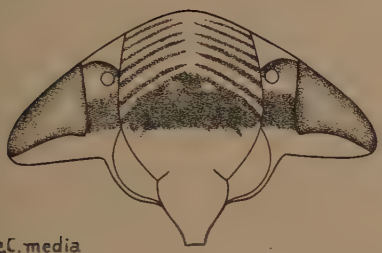
FIGS. 1 to 9. Ventral view of head. Typical forms.

PLATE VII.

1. C. arborina

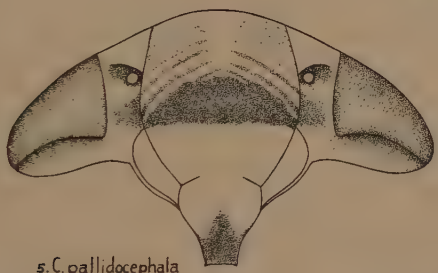


3. C. juniperina

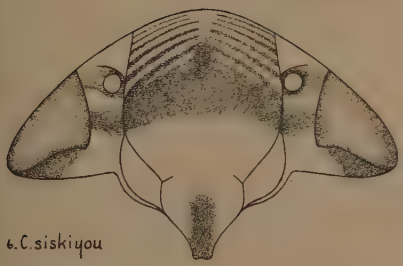


2. C. media

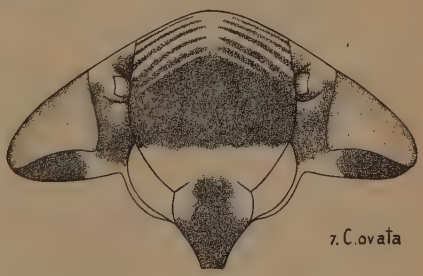
4. C. newporta



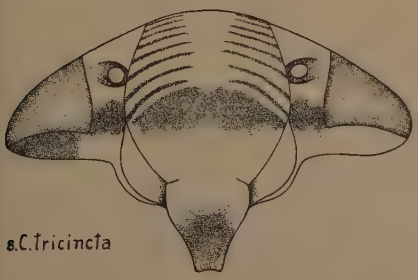
5. C. pallidocephala



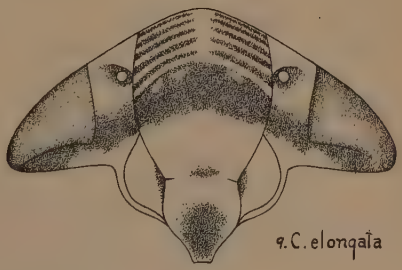
6. C. siskiyou



7. C. ovata



8. C. tricincta

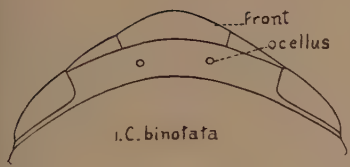


9. C. elongata

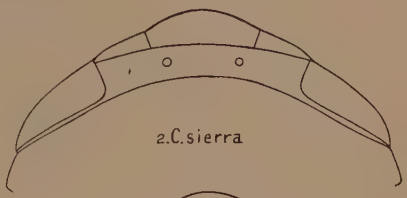
PLATE VIII.

FIGS. 1 to 6. Dorsal view of head.
FIGS. 7 to 12. Dorsal view of pronotum.

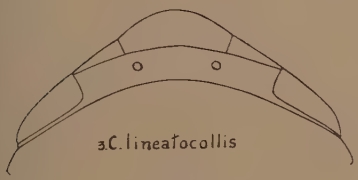
PLATE VIII.



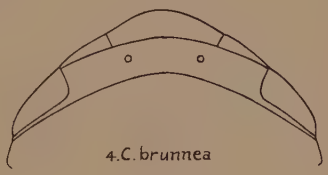
1. C. binotata



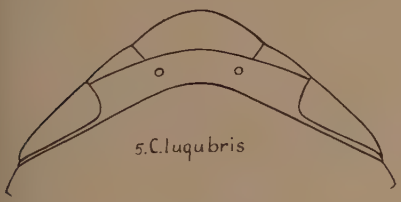
2. C. sierra



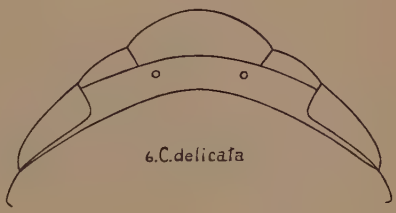
3. C. lineatocollis



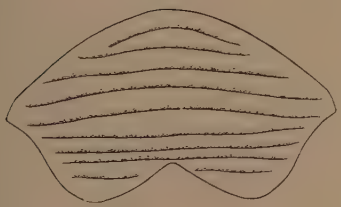
4. C. brunnea



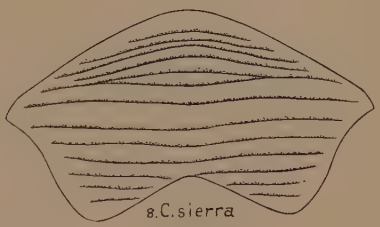
5. C. luqubris



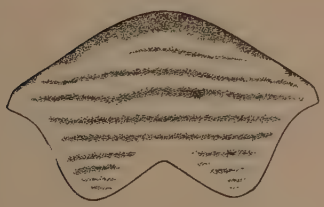
6. C. delicata



7. C binotata



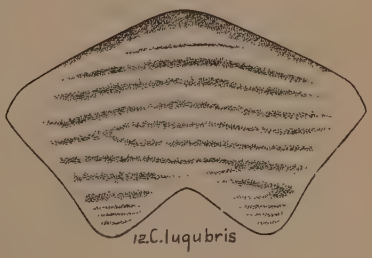
8. C. sierra



9. C. brunnea

10. C. lineatocollis

11. C. delicata



12. C. luqubris

PLATE IX.

FIGS. 1 to 5. Dorsal view of head.
FIGS. 6 to 12. Dorsal view of pronotum.

PLATE IX.

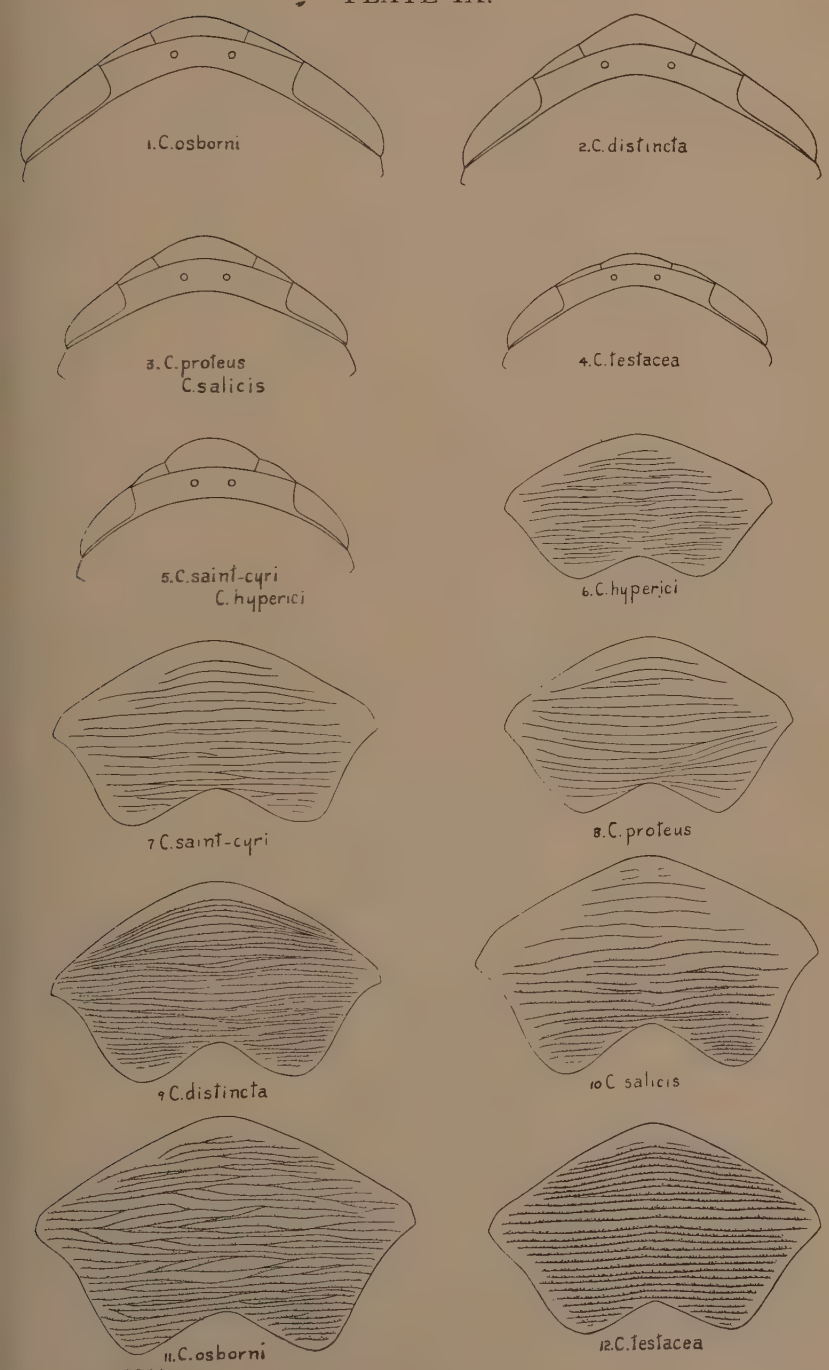

1. C. osborni
2. C. distincta
3. C. proteus
C. salicis
4. C. testacea
5. C. saint-cyri
C. hyperici
6. C. hyperici
7 C. saint-cyri
8. C. proteus
9 C. distincta
10 C salicis
11. C. osborni
12. C. testacea

PLATE X.

FIGS. 1 to 8. Dorsal view of head.
FIGS. 9 to 16. Dorsal view of pronotum, showing wrinkles.

PLATE X.

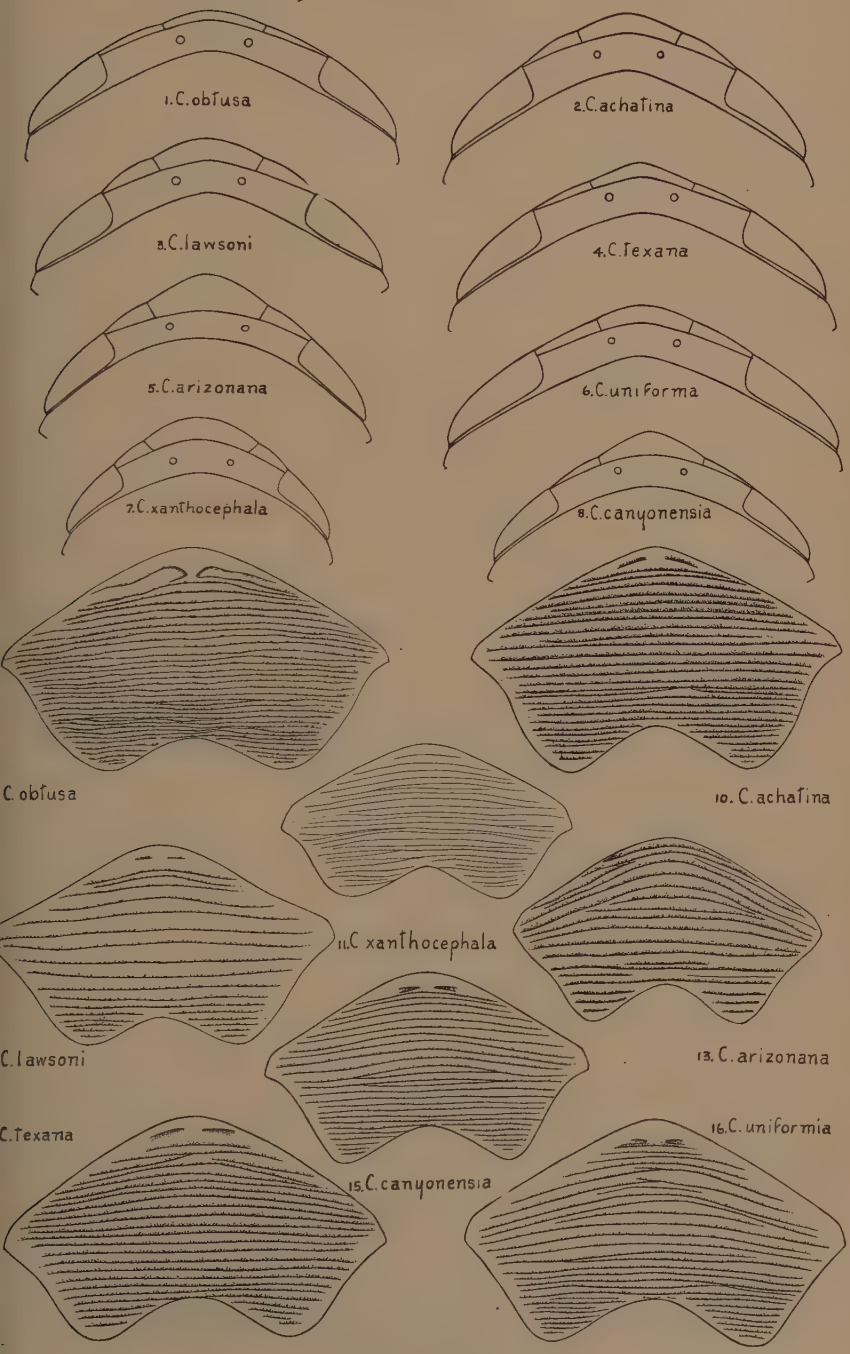

1. C. obtusa
2. C. achatina
3. C. lawsoni
4. C. texana
5. C. arizonana
6. C. uniforma
7. C. xanthocephala
8. C. canyonensia
C. obtusa
10. C. achatina
11. C xanthocephala
C. lawsoni
13. C. arizonana
C. texana
16. C. uniformia
15. C. canyonensia

PLATE XI.

FIGS. 1 to 7. Dorsal view of head.
FIGS. 8 to 15. Dorsal view of pronotum, showing wrinkles.

PLATE XI.

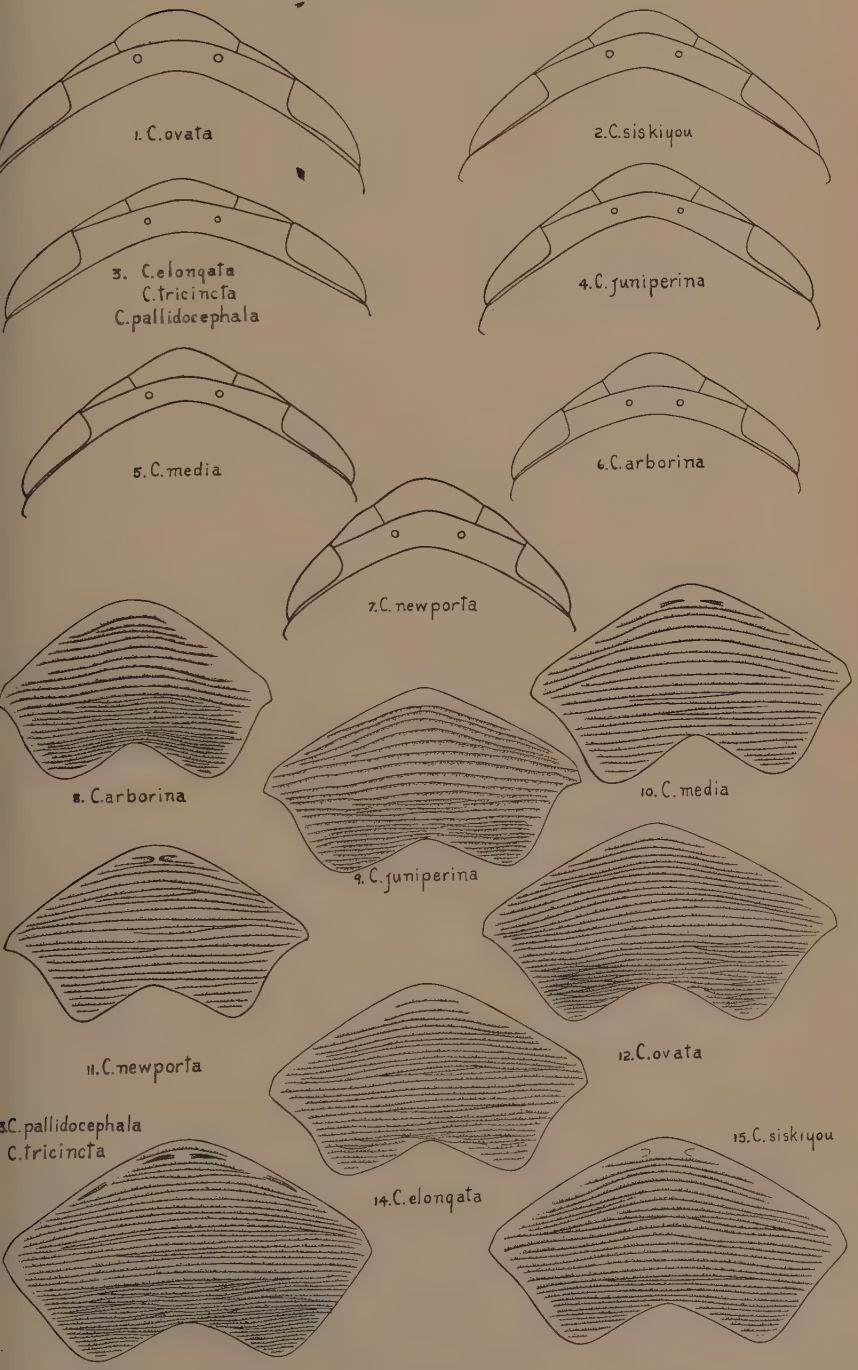
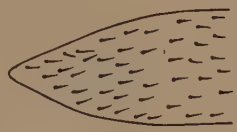

1. C. ovata
2. C. siskiyou
3. C. elongata
C. tricincta
C. pallidocephala
4. C. juniperina
5. C. media
6. C. arborina
7. C. newporta
8. C. arborina
9. C. juniperina
10. C. media
11. C. newporta
12. C. ovata
13. C. pallidocephala
C. tricincta
14. C. elongata
15. C. siskiyou

PLATE XII.

FIGS. 1 to 6. Apex of clavus of elytron, showing distribution of hairs.
FIGS. 7 to 12. Elytron, drawn from microscope slide.

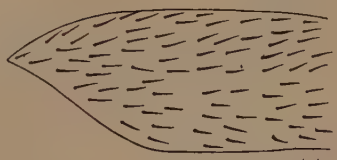
PLATE XII.

1. C. lineatocollis

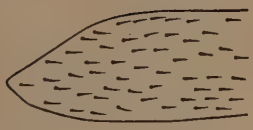


2. C. luqubris

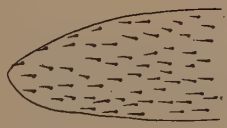
3. C. brunnea



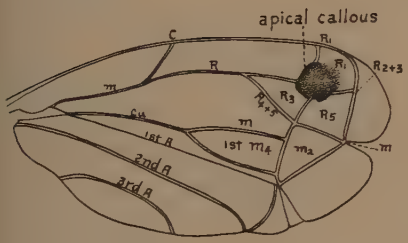
4. C. delicata



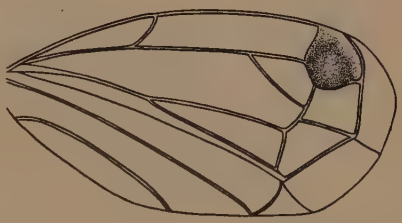
5. C. binotata



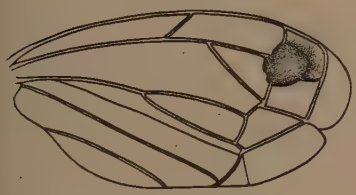
6. C. sierra



7. C. lineatocollis

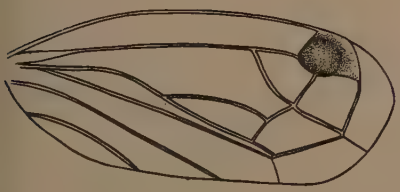


8. C. luqubris

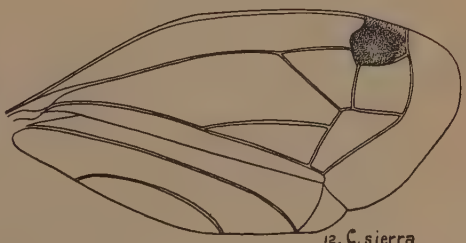


9. C. brunnea

10. C. delicata



11. C. binotata



12. C. sierra

PLATE XIII.

FIGS. 1 to 7. Apex of clavus of elytron, showing distribution of hairs.
FIGS. 8 to 14. Elytron, drawn from microscope slide.

PLATE XIII.

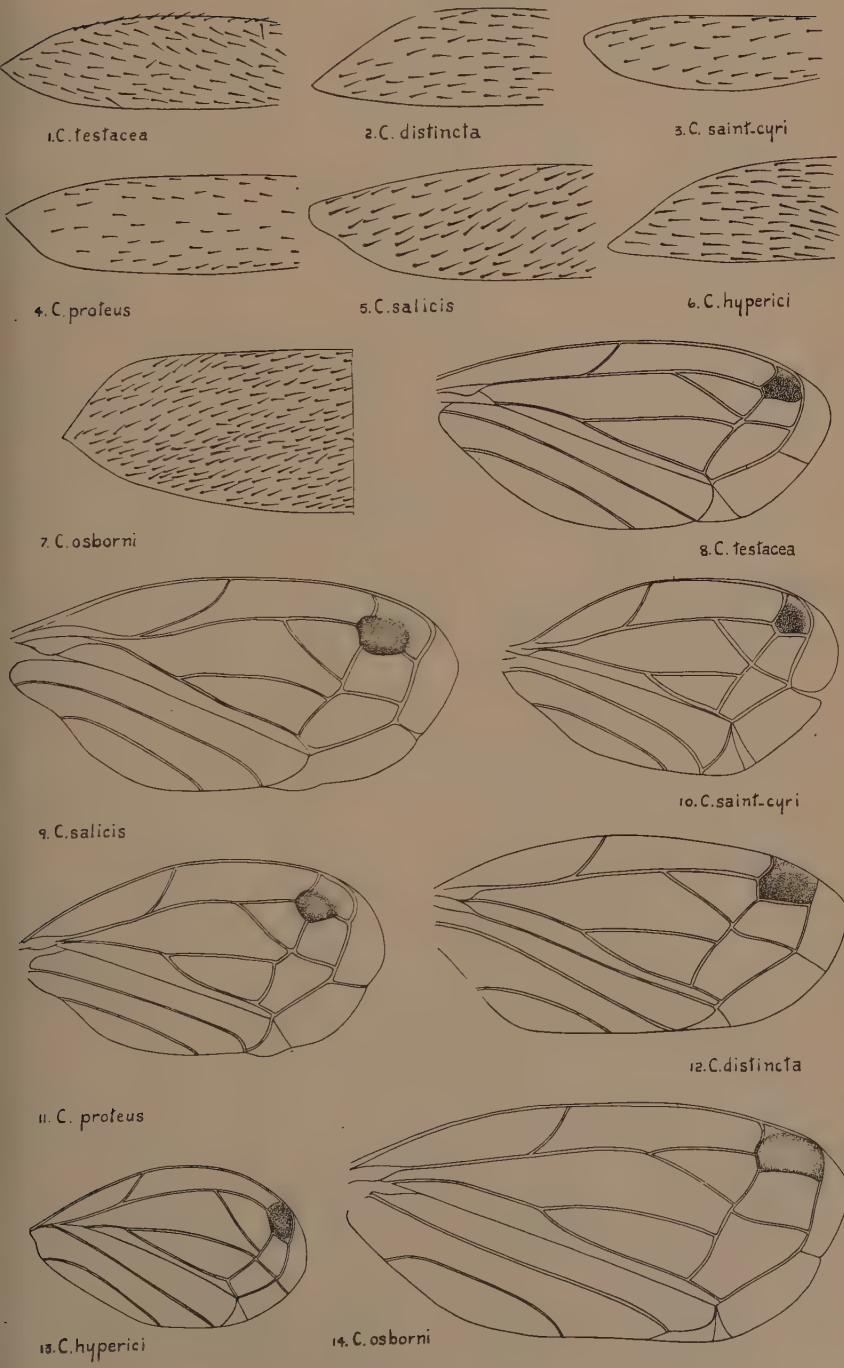

1. C. testacea
2. C. distincta
3. C. saint-cyri
4. C. proteus
5. C. salicis
6. C. hyperici
7. C. osborni
8. C. testacea
9. C. salicis
10. C. saint-cyri
11. C. proteus
12. C. distincta
13. C. hyperici
14. C. osborni

PLATE XIV.

FIGS. 1 to 8. Apex of clavus of elytron, showing distribution of hairs.
FIGS. 9 to 16. Elytron, drawn from microscope slide.

PLATE XIV.

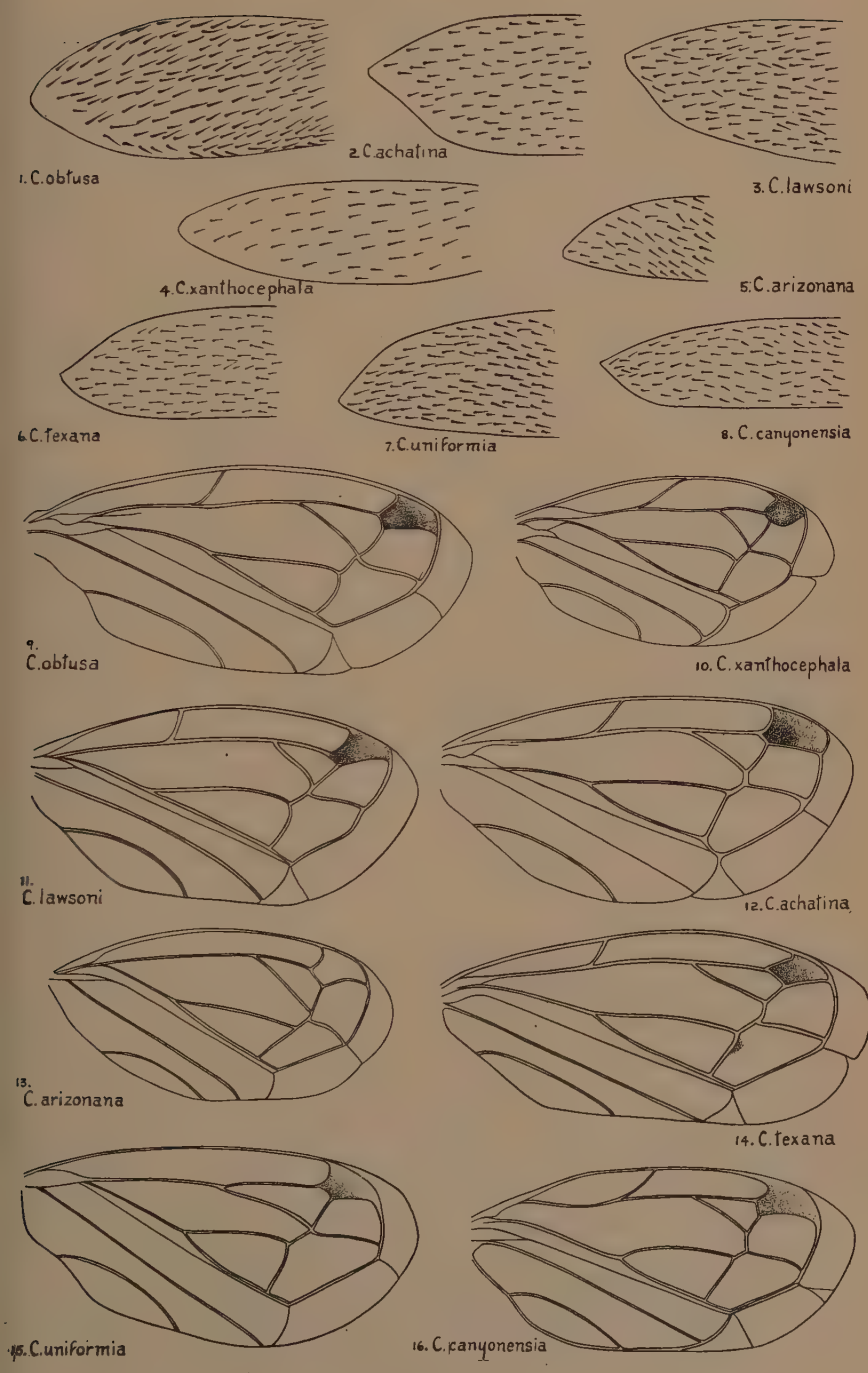

1. C. obtusa
2. C. achatina
3. C. lawsoni
4. C. xanthocephala
5. C. arizonana
6. C. texana
7. C. uniformia
8. C. canyonensia
9. C. obtusa
10. C. xanthocephala
11. C. lawsoni
12. C. achatina
13. C. arizonana
14. C. texana
15. C. uniformia
16. C. canyonensia

PLATE XV.

FIGS. 1 to 9. Apex of clavus of elytron, showing distribution of hairs.
FIGS. 10 to 18. Elytron, drawn from microscope slide.

PLATE XV.

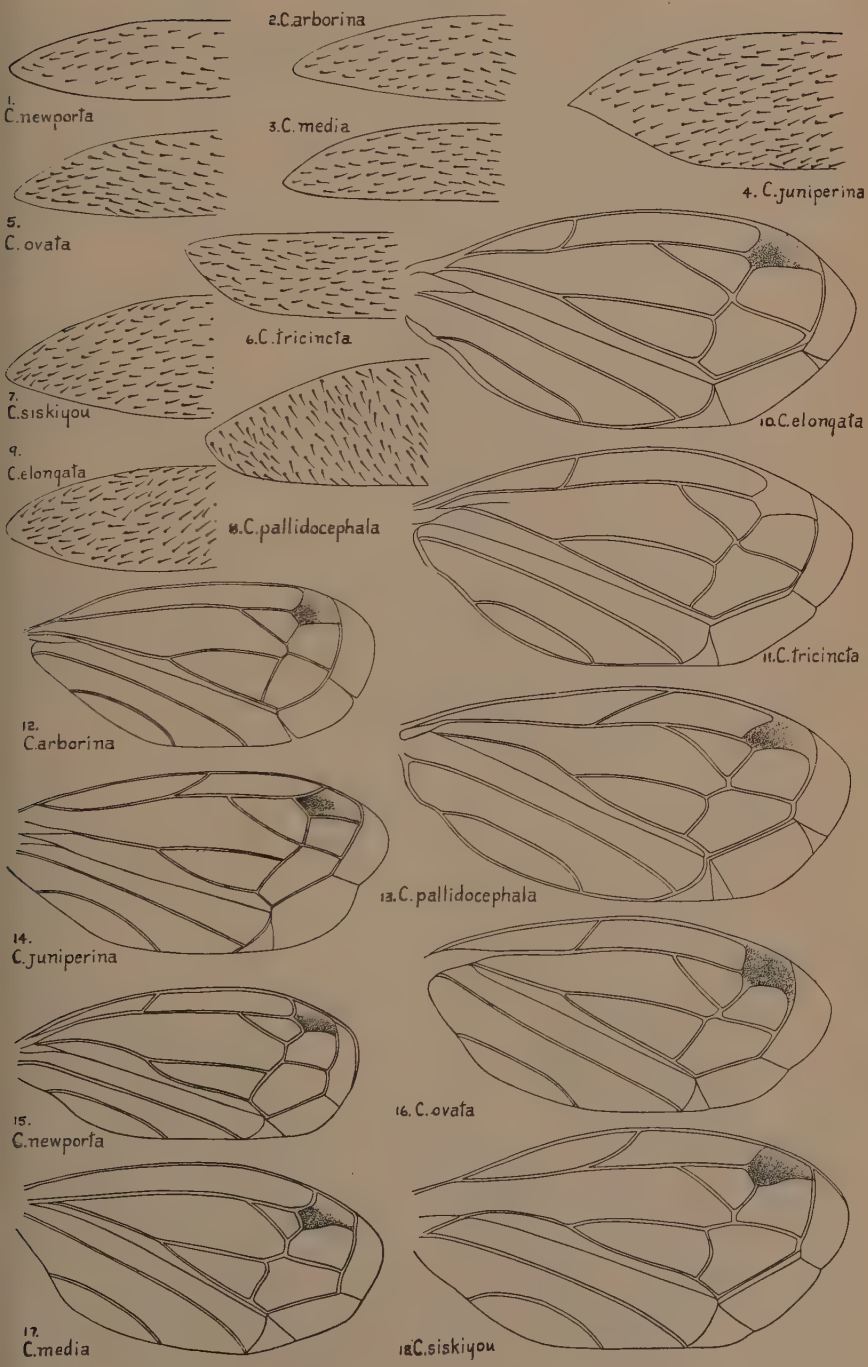
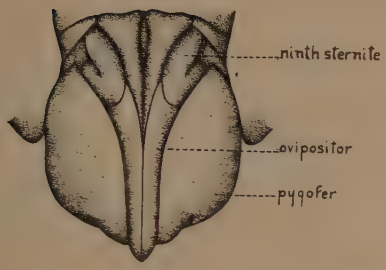

1. C. newporta
2. C. arborina
3. C. media
4. C. juniperina
5. C. ovata
6. C. tricincta
7. C. siskiyou
8. C. pallidocephala
9. C. elongata
10. C. elongata
11. C. tricincta
12. C. arborina
13. C. pallidocephala
14. C. juniperina
15. C. newporta
16. C. ovata
17. C. media
18. C. siskiyou

PLATE XVI.

FIGS. 1, 2, 3, 4, 6. Ventral view of female pygofer, drawn from a specimen relaxed in boiling water.

FIG. 5. Ventral view of female pygofer, drawn from unrelaxed specimen.

PLATE XVI.



1. C. luguberis

2. C. lineatocollis

3. C. brunnea

5. C. sierra

4. C. binotata

6. C. delicata

PLATE XVII.

FIGS. 1 to 7. Ventral view of female pygofer, drawn from a specimen relaxed in boiling water.

PLATE XVII.

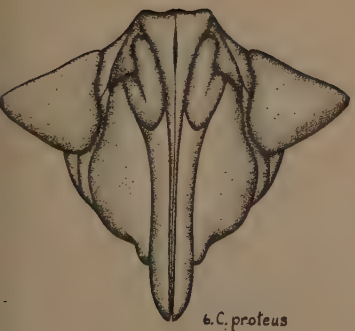
1. C. testacea

2. C. osborni

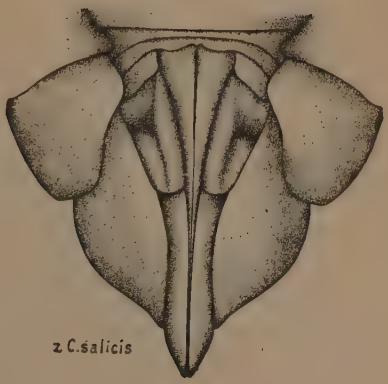
3. C. distincta

4. C. saint-cyri

5. C. hyperici



6. C. proteus

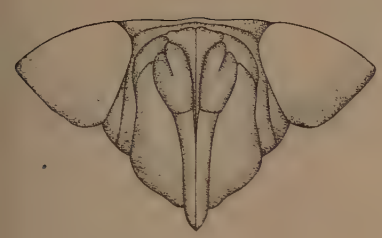


7. C. salicis

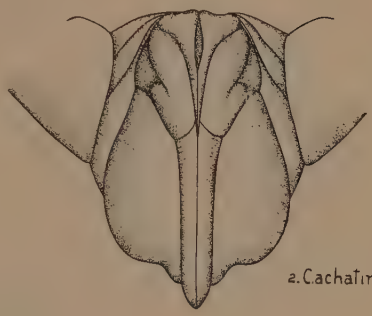
PLATE XVIII.

FIGS. 1 to 8. Ventral view of female pygofer, drawn from a specimen relaxed in boiling water.

PLATE XVIII.



1. C. xanthocephala

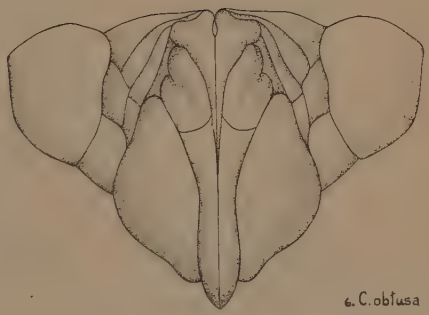


2. C. achatina

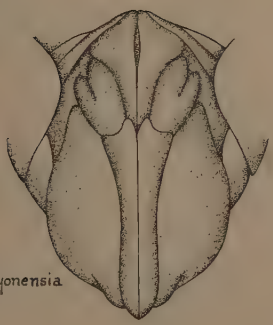
3. C. arizonana

4. C. lawsoni

5. C. texana



6. C. obtusa



7. C. canyonensia

8. C. uniformia

PLATE XIX.

FIGS. 1 to 9. Ventral view of female pygofer, drawn from specimen relaxed in boiling water.

PLATE XIX.

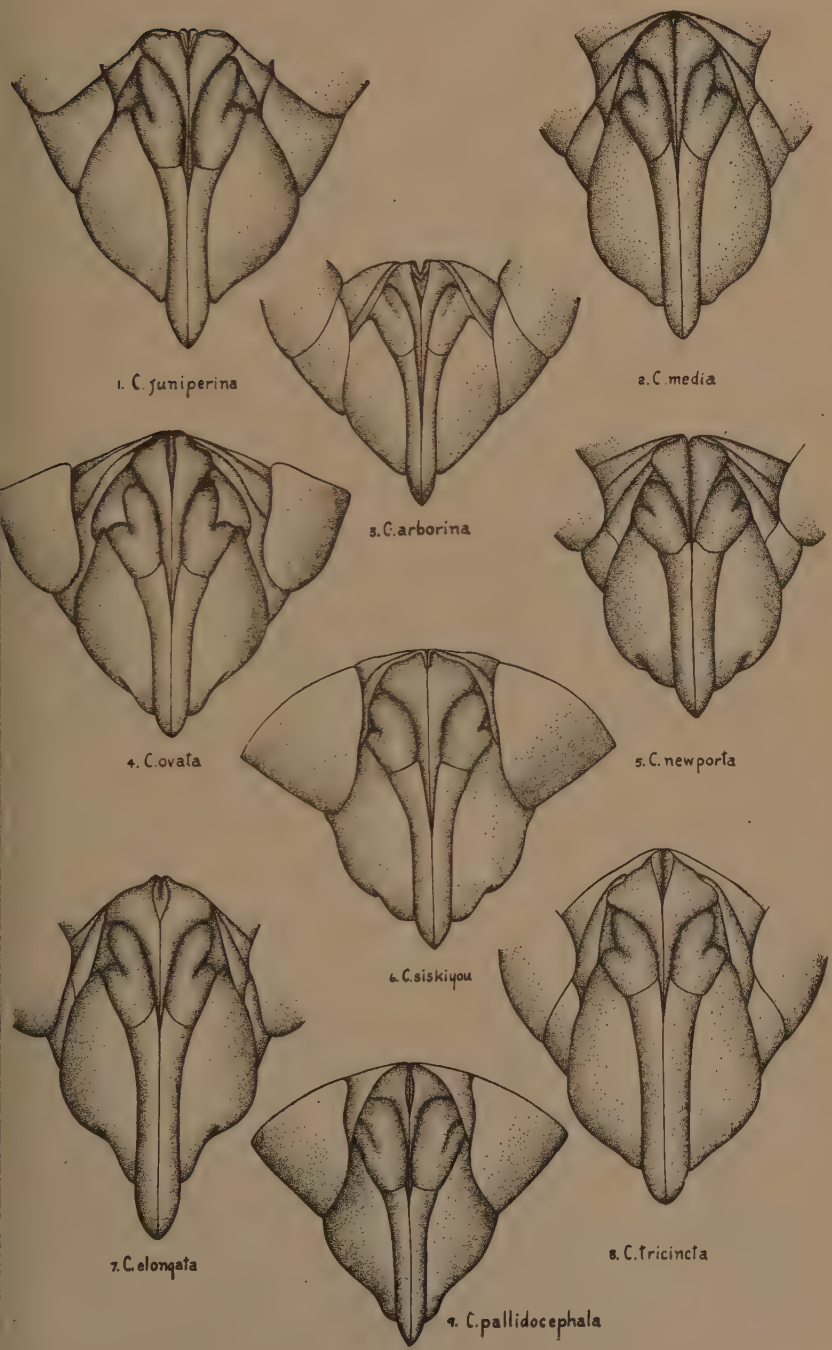

1. C. juniperina
2. C. media
3. C. arborina
4. C. ovata
5. C. newporta
6. C. siskiyou
7. C. elongata
8. C. tricincta
9. C. pallidocephala

PLATE XX.

FIG. 1. Lateral valve of ovipositor.
FIG. 1*a*. Inner valve of ovipositor.
FIG. 2. Lateral valve.
FIG. 2*a*. Inner valve.
FIG. 3. Inner valve.
FIG. 3*a*. Lateral valve.
FIG. 4. Inner valve.
FIG. 4*a*. Lateral valve.
FIG. 5. Inner valve.
FIG. 5*a*. Lateral valve.
FIG. 6. Inner valve.
FIG. 6*a*. Lateral valve.

PLATE XX.

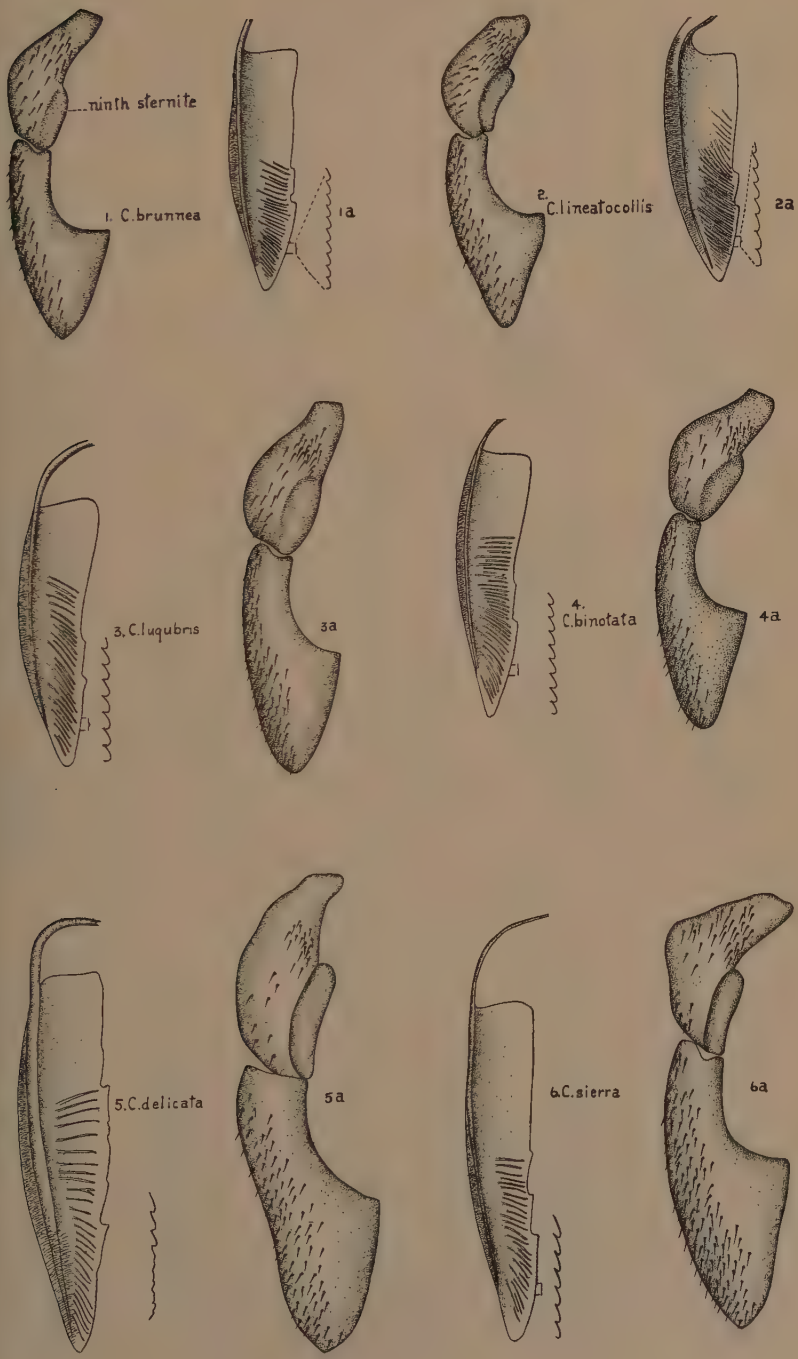

ninth sternite
1. C. brunnea
1a
2. C. lineatocollis
2a
3. C. luqubris
3a
4. C. binotata
4a
5. C. delicata
5a
6. C. sierra
6a

PLATE XXI.

FIG. 1. Lateral valve of ovipositor.
FIG. 1*a*. Inner valve of ovipositor.
FIG. 2. Inner valve.
FIG. 2*a*. Lateral valve.
FIG. 3. Lateral valve.
FIG. 3*a*. Inner valve.
FIG. 4. Lateral valve.
FIG. 4*a*. Inner valve.
FIG. 5. Inner valve.
FIG. 5*a*. Lateral valve.
FIG. 6. Lateral valve.
FIG. 6*a*. Inner valve.
FIG. 7. Lateral valve.
FIG. 7*a*. Inner valve.

PLATE XXI.

1.
C. proteus
1a
2.
C. salicis
2a
3
C. testacea
3a
4
4a
C. hyperici
5
C. saint-cyri
C. osborni
C. distincta
6.
6a
7.
7a.
8a

PLATE XXII.

FIGS. 1, 2, 3. Lateral valve of ovipositor.
FIGS. 1*a*, 2*a*, 3*a*. Inner valve of ovipositor.
FIG. 4. Lateral valve.
FIG. 4*a*. Inner valve.
FIG. 5. Lateral valve.
FIG. 5*a*. Inner valve.
FIG. 6. Inner valve.
FIG. 6*a*. Lateral valve.
FIG. 7. Inner valve.
FIG. 7*a*. Lateral valve.
FIG. 8. Inner valve.
FIG. 8*a*. Lateral valve.

PLATE XXII.

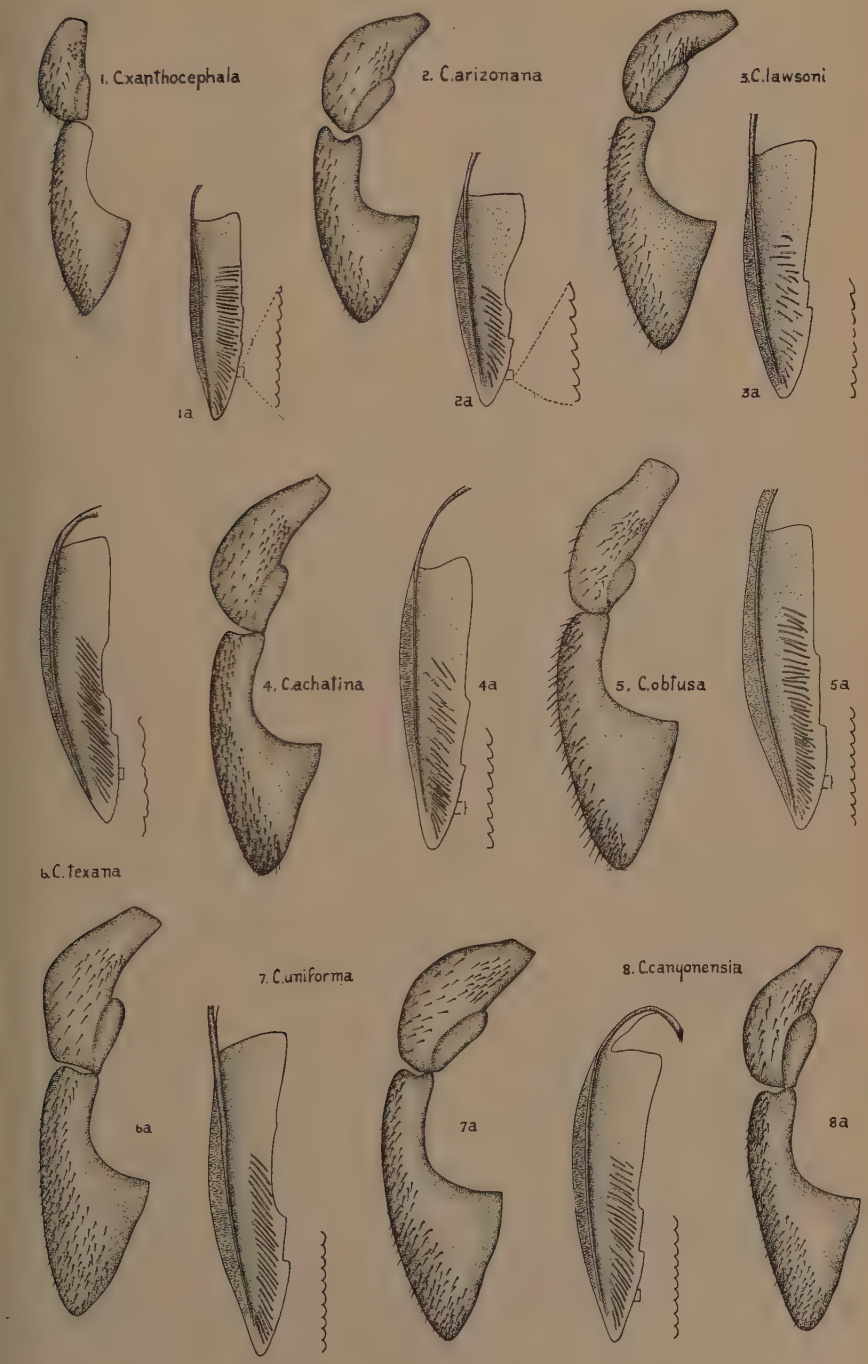

1. C.xanthocephala
1a
2. C.arizonana
2a
3. C.lawsoni
3a
4. C.achatina
4a
5. C.obtusa
5a
6. C.texana
6a
7. C.uniforma
7a
8. C.canyonensia
8a

PLATE XXIII.

FIG. 1. Lateral valve of ovipositor.
FIG. 1*a*. Inner valve of ovipositor.
FIG. 2. Lateral valve.
FIG. 2*a*. Inner valve.
FIG. 3. Lateral valve.
FIG. 3*a*. Inner valve.
FIG. 4. Inner valve.
FIG. 4*a*. Lateral valve.
FIG. 5. Lateral valve.
FIG. 5*a*. Inner valve.
FIG. 6. Inner valve.
FIG. 6*a*. Lateral valve.
FIG. 7. Lateral valve.
FIG. 7*a*. Inner valve.
FIG. 8. Lateral valve.
FIG. 8*a*. Inner valve.
FIG. 9. Inner valve.
FIG. 9*a*. Lateral valve.

PLATE XXIII.

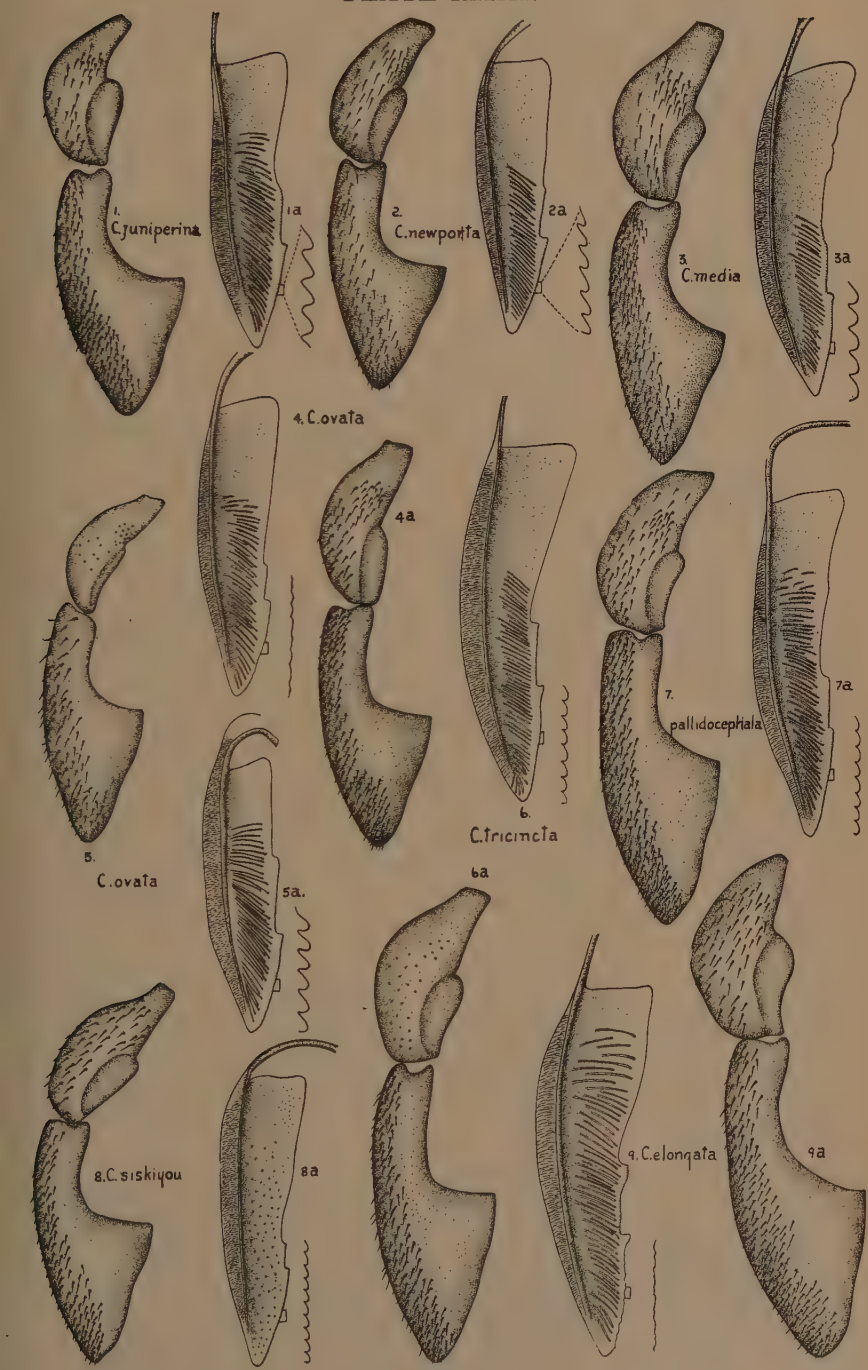

1. C. juniperina
1a
2. C. newportia
2a
3. C. media
3a
4. C. ovata
4a
5. C. ovata
5a.
6. C. tricincta
6a
7. pallidocephala
7a
8. C. siskiyou
8a
9. C. elongata
9a

PLATE XXIV.

Ventral view of male pygofer, drawn from specimens relaxed in boiling water, after which the abdomens or pygofers were removed from body in order to draw.

PLATE XXIV.

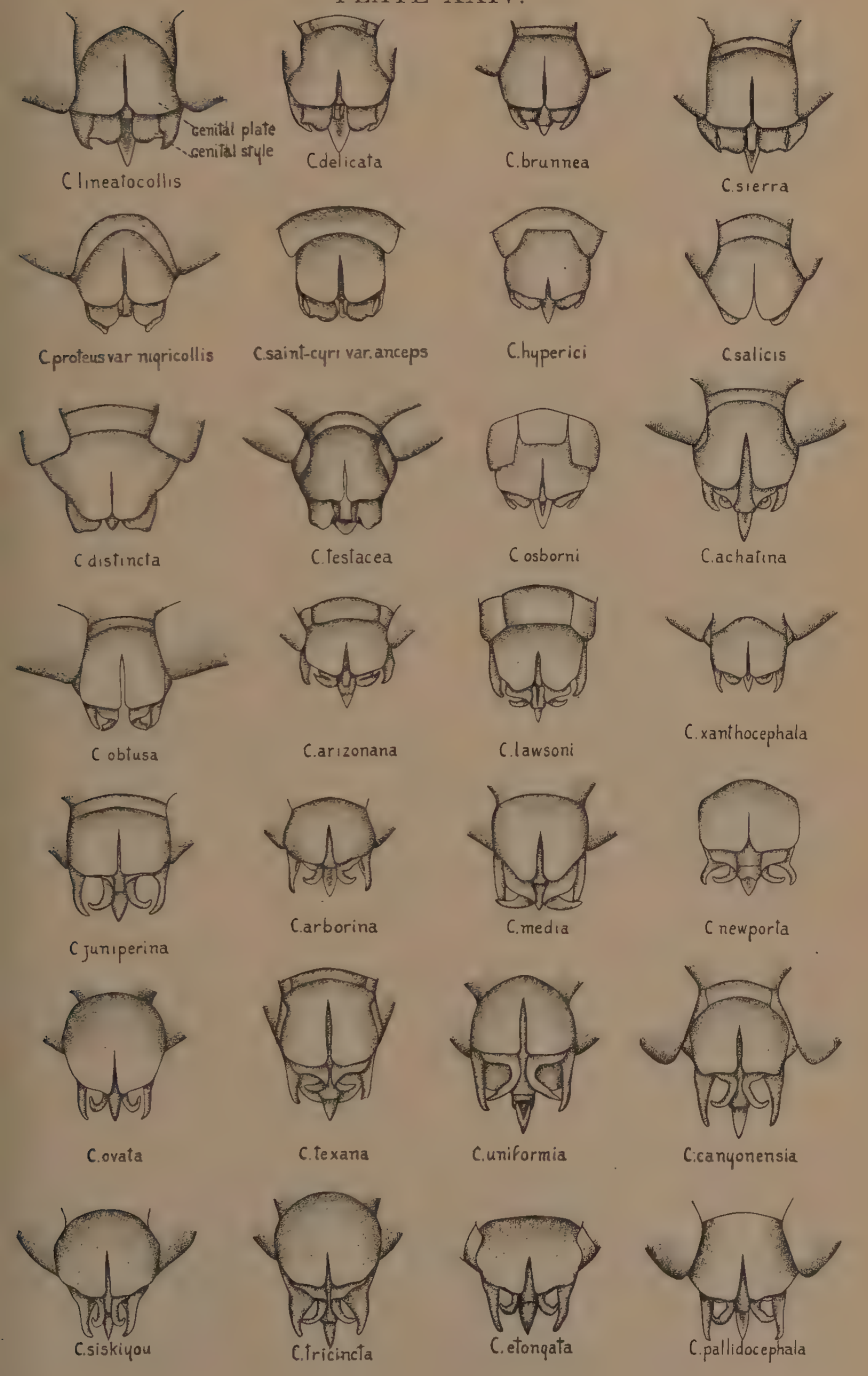

genital plate
genital style
C. lineatocollis
C. delicata
C. brunnea
C. sierra
C. proteus var. nigricollis
C. saint-cyri var. anceps
C. hyperici
C. salicis
C. distincta
C. testacea
C. osborni
C. achatina
C. obtusa
C. arizonana
C. lawsoni
C. xanthocephala
C. juniperina
C. arborina
C. media
C. newporta
C. ovata
C. texana
C. uniformia
C. canyonensis
C. siskiyou
C. tricincta
C. elongata
C. pallidocephala

PLATE XXV.

FIG. 1. Dorsal view of male genitalia.
FIG. 1*a*. Lateral view of style.
FIG. 1*b*. Ventral view of style.
FIG. 2. Ventral view of style.
FIG. 2*a*. Dorsal view of male genitalia.
FIG. 3. Dorsal view of male genitalia.
FIG. 3*a*. Lateral view of style.
FIG. 3*b*. Ventral view of style.
FIG. 4. Dorsal view of genitalia.
FIG. 4*a*. Lateral view of style.
FIG. 4*b*. Ventral view of style.
FIG. 5. Lateral view of style.
FIG. 5*a*. Ventral view of style.
FIG. 5*b*. Dorsal view of genitalia.
FIG. 6. Lateral view of style.
FIG. 6*a*. Ventral view of style.
FIG. 6*b*. Dorsal view of genitalia.
FIG. 7. Dorsal view of genitalia.
FIG. 7*a*. Ventral view of style.
FIG. 7*b*. Lateral view of style.
FIG. 8. Dorsal view of genitalia.
FIG. 8*a*. Lateral view of style.
FIG. 8*b*. Ventral view of style.
FIG. 9. Dorsal view of genitalia.
FIG. 9*a*. Ventral view of style.
FIG. 9*b*. Lateral view of style.
FIG. 10. Dorsal view of genitalia.
FIG. 10*a*. Ventral view of style.
FIG. 11. Dorsal view of genitalia.
FIG. 11*a*. Ventral view of style.
FIG. 11*b*. Lateral view of style.

PLATE XXV.

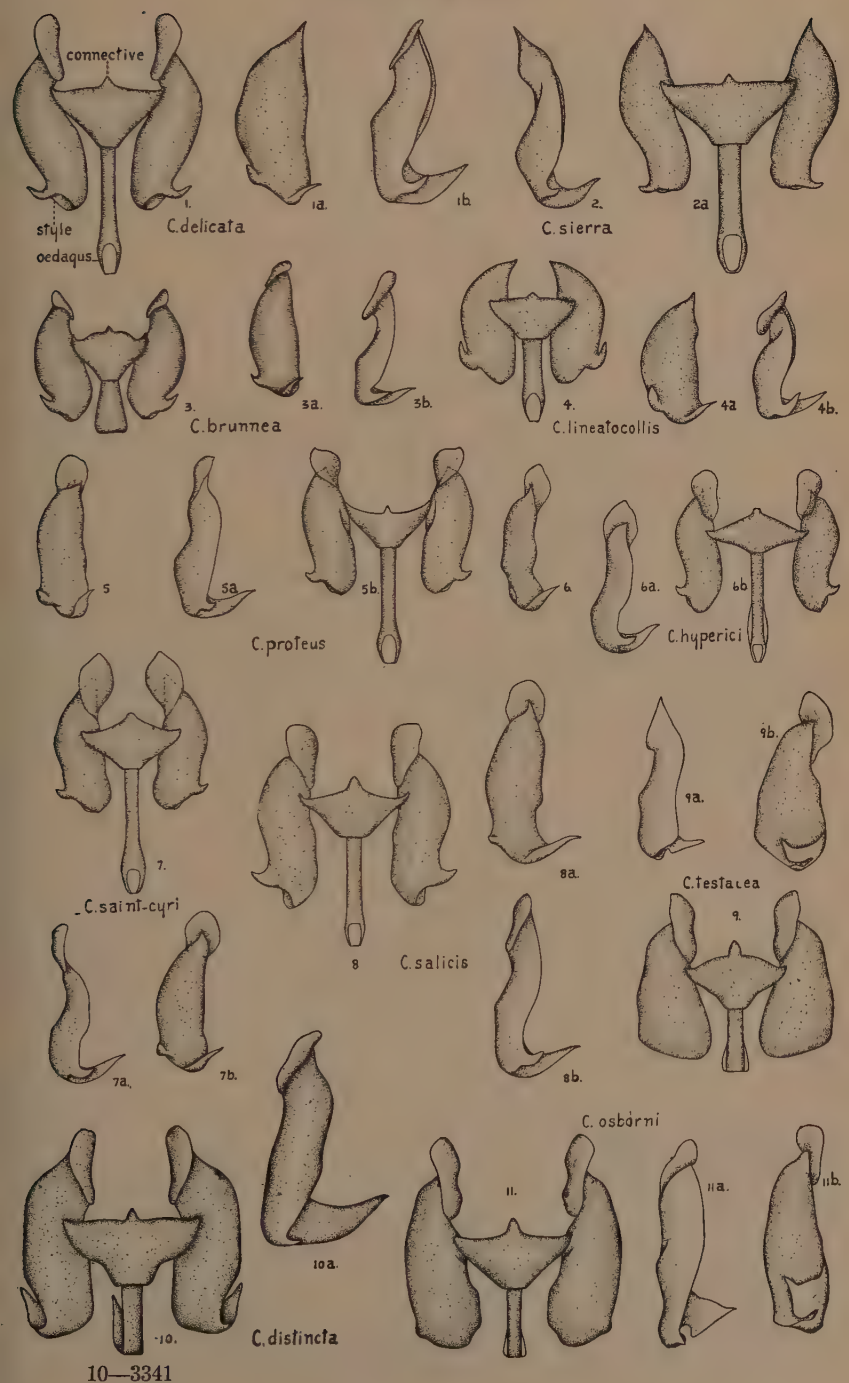

connective
style
oedagus
1.
C.delicata
1a.
1b
2.
C.sierra
2a
3.
C.brunnea
3a.
3b.
4.
C.lineatocollis
4a
4b.
5
5a
5b
C.proteus
6
6a.
6b
C.hyperici
7.
C.saint-cyri
8
C.salicis
8a.
8b.
9a.
9b.
C.testacea
9.
7a.
7b.
C. osborni
10a.
10.
C.distincta
11.
11a.
11b.

PLATE XXVI.

FIG. 1. Dorsal view of male genitalia.
FIG. 1*a*. Ventral view of style.
FIG. 1*b*. Lateral view of style.
FIG. 2. Ventral view of style.
FIG. 2*a*. Lateral view of style.
FIG. 2*b*. Dorsal view of genitalia.
FIG. 3. Ventral view of style.
FIG. 3*a*. Lateral view of style.
FIG. 3*b*. Dorsal view of genitalia.
FIG. 4. Dorsal view of genitalia.
FIG. 4*a*. Ventral view of style.
FIG. 4*b*. Lateral view of style.
FIG. 5. Ventral view of style.
FIG. 5*a*. Lateral view of style.
FIG. 5*b*. Dorsal view of genitalia.
FIG. 6. Ventral view of style.
FIG. 6*a*. Dorsal view of genitalia.
FIG. 7. Dorsal view of genitalia.
FIG. 7*a*. Ventral view of style.
FIG. 7*b*. Lateral view of style.
FIG. 8. Ventral view of style.
FIG. 8*a*. Dorsal view of genitalia.

PLATE XXVI.

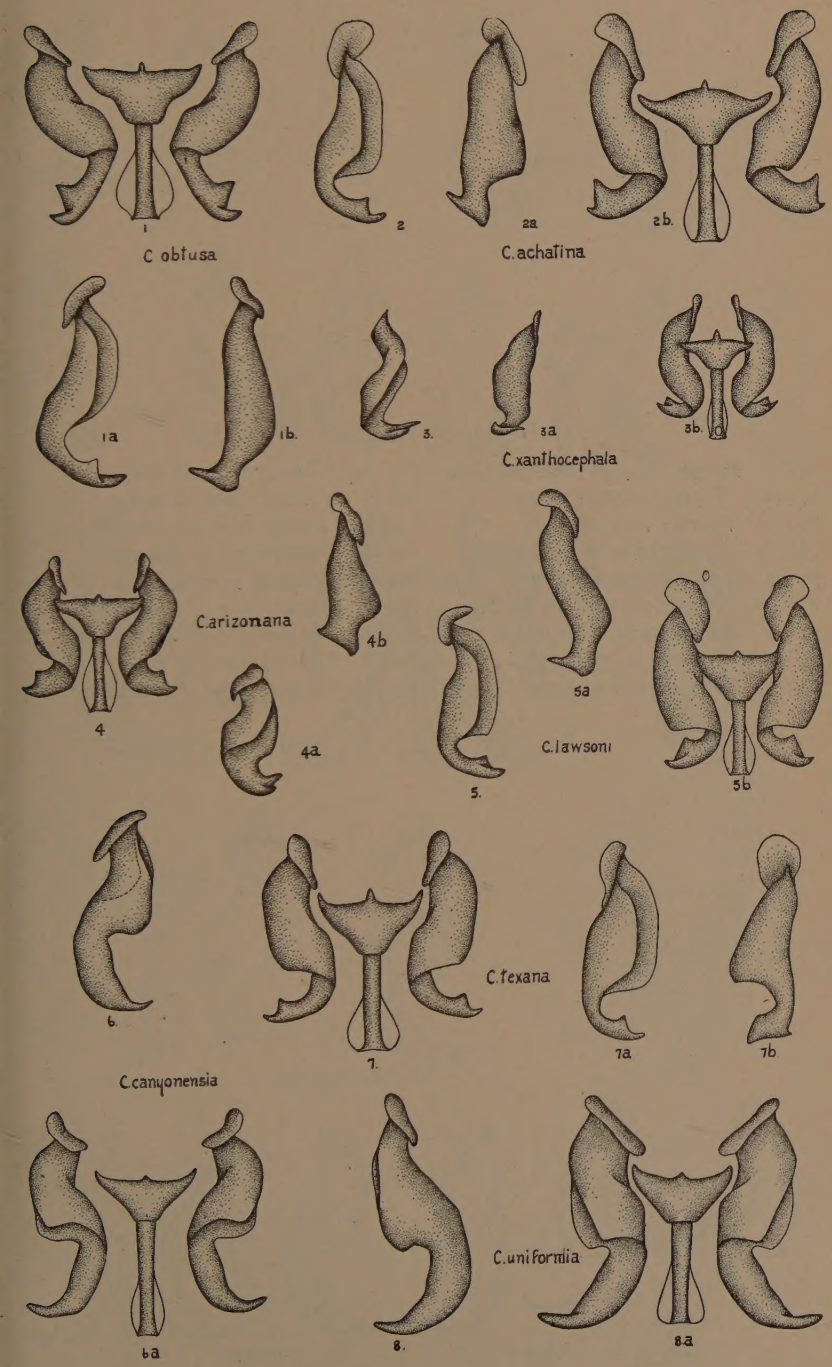
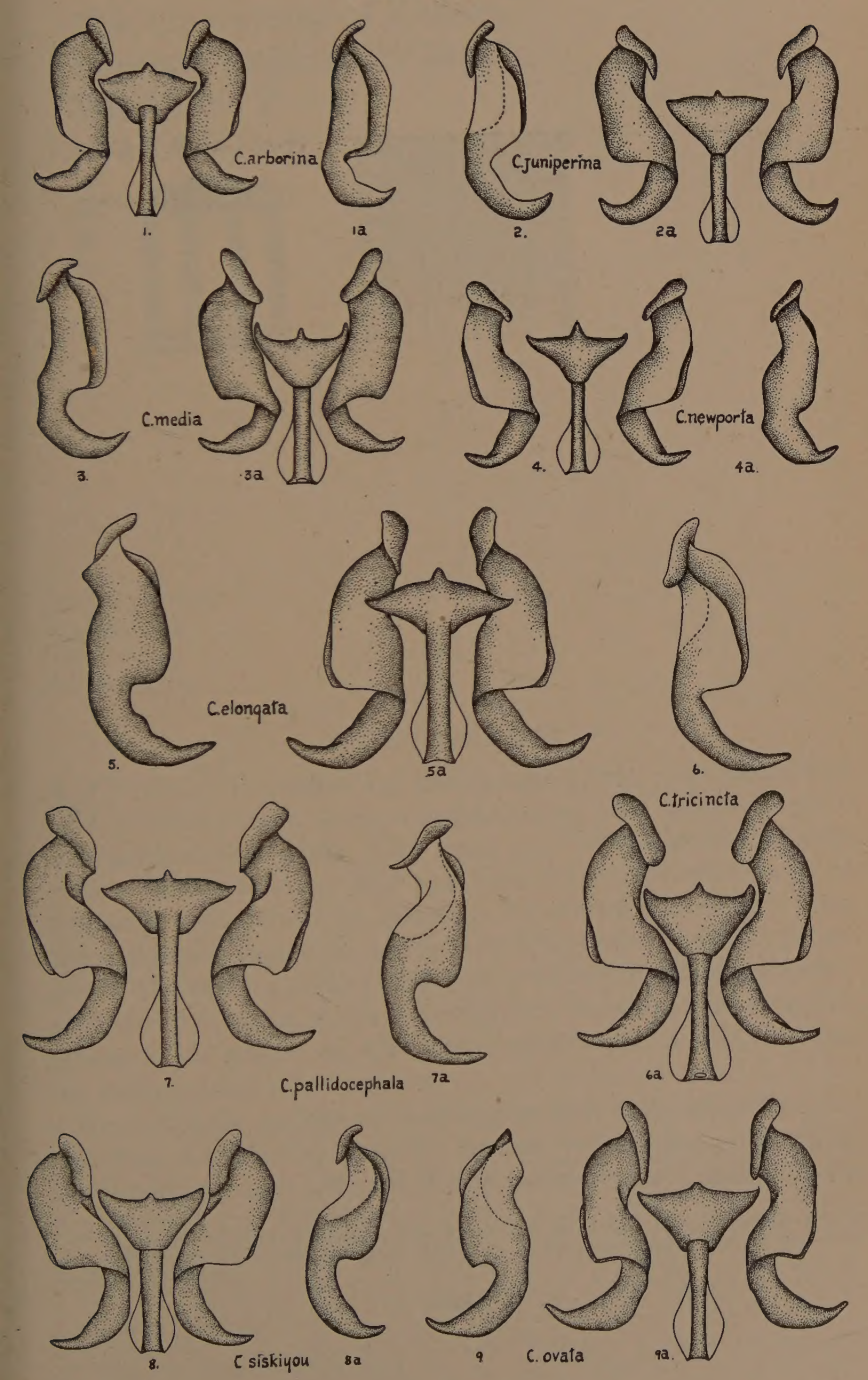

1
C obtusa
2
2a
2b.
C. achatina
1a
1b.
3.
3a
3b.
C. xanthocephala
4
C. arizonana
4b
4a
5a
5.
C. lawsoni
5b
6.
C. canyonensia
7.
C. texana
7a
7b
6a
8.
C. uniformia
8a

PLATE XXVII.

FIG. 1. Dorsal view of male genitalia.
FIG. 1*a*. Ventral view of style.
FIG. 2. Ventral view of style.
FIG. 2*a*. Dorsal view of genitalia.
FIG. 3. Ventral view of style.
FIG. 3*a*. Dorsal view of genitalia.
FIG. 4. Dorsal view of genitalia.
FIG. 4*a*. Ventral view of style.
FIG. 5. Ventral view of style.
FIG. 5*a*. Dorsal view of genitalia.
FIG. 6. Ventral view of style.
FIG. 6*a*. Dorsal view of genitalia.
FIG. 7. Dorsal view of genitalia.
FIG. 7*a*. Ventral view of style.
FIG. 8. Dorsal view of genitalia.
FIG. 8*a*. Ventral view of style.
FIG. 9. Ventral view of style.
FIG. 9*a*. Dorsal view of genitalia.

PLATE XXVII.


C.arborina
1.
1a
C.juniperina
2.
2a
C.media
3.
3a
C.newporta
4.
4a.
C.elongata
5.
5a
6.
C.tricincta
7.
C.pallidocephala
7a.
6a
8.
C siskiyou
8a
9
C. ovata
9a.